The Journal of Pediatrics

VOL. 27 AUGUST, 1945 NO. 2

Original Communications

THE CRYING OF NEWLY BORN BABIES

II. THE INDIVIDUAL PHASE

C. ANDERSON ALDRICH, M.D.,* CHIEH SUNG, M.D., D.P.H.,† AND CATHARINE KNOP, M.D.‡
ROCHESTER, MINN.

WITH THE TECHNICAL ASSISTANCE OF GERALDINE STEVENS, R.N., AND MARGARET BURCHELL, B.SC.§

THIS is our second report[1] summarizing one month's continuous observation of crying as it occurred in the nursery of newborn babies at one of the hospitals at Rochester, Minn. The previous publication dealt with the crying of the babies as a community only, while this article concerns itself mainly with that of individual babies.

The object of the study was to obtain accurate information as to the amount of crying which occurred and to investigate its causes. We, therefore, interested ourselves in the duration in minutes, the intensity and the number and possible causes of crying episodes indulged in by the individual babies. We wanted to know how crying was distributed throughout each day and something about its variations during the first eight days of life. In studying the probable causes of crying we made notes of environmental influences such as food intake and nursing care and estimated the discomfort due to certain possible factors. We look on this work as a preliminary survey only and, because of the many indefinite assumptions which had to be made as to causes, we cannot claim mathematical accuracy in their tabulation. This is merely an initial attempt to bring order out of that most chaotic of hospital wards, the nursery of newborn babies.

METHOD OF INVESTIGATION

Our original data concerned all babies (seventy-two) cared for in the nursery during April, 1944. For our present study, however, we selected only those whose stay in the nursery was a full eight days. This left us with fifty babies on our list. All infants in the ward were watched constantly by four observers, who took turns during the twenty-four-hour periods. The recordings were made from midnight to midnight for each day. The average number of babies in the nursery at one time was twenty. We tried to take into con-

*Section on Pediatrics.
†Assistant in Pediatrics, Mayo Clinic.
‡Fellow in Pediatrics, Mayo Foundation.
§Volunteer Worker, Rochester Child Health Project.

From the Rochester Child Health Project.

sideration the nursery and floor routines so that our activities might interrupt the usual procedures as little as possible. We were solely observers, who recorded data relative to the crying of each inhabitant of the nursery.

Actually, each crying period was indicated on the work sheet as a straight line, above which the crying time in minutes was indicated and beneath which was shown the possible reason for the spell (*a* standing for hunger; *b*, for vomitus; *c*, for soiled diapers; *d*, for wet diapers and *j*, for unknown reasons). The nursing care was similarly charted as a red line, above which was placed the number of minutes of care. This consisted of diaper changing, taking temperatures and offering water and also included the feeding time spent in the mother's or the nurse's arms.

From these original data, calculations were made and figures and tables were drawn: (1) to illustrate the incidence of crying of individual babies in relation to nursing care; (2) to show the daily and total amount of crying of each baby and the distribution curve of their differences in this respect; (3) to demonstrate the average crying curve of the first eight days of life and (4) to estimate the causes of crying and its relation to feeding, gain of weight, and other environmental factors.

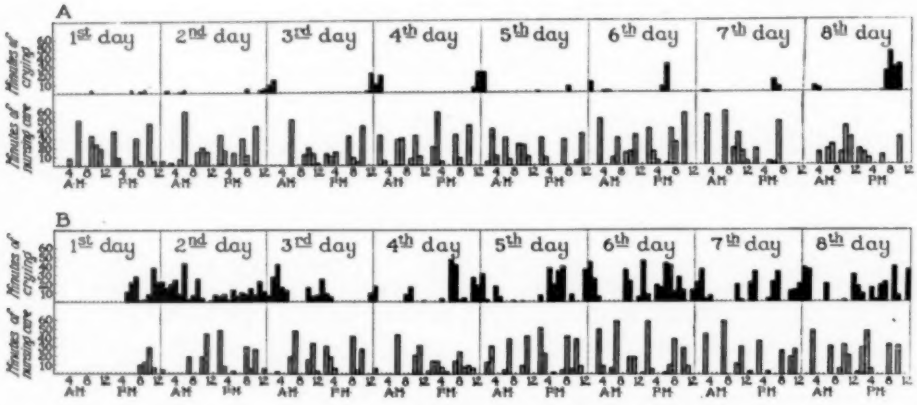


Fig. 1.—Crying chart compared with nursing care (two babies).

RESULTS

Graphic Representation of the Crying of Babies and Their Nursing Care for the First Eight Days.—Of the fifty charts made of crying activity as compared with nursing care during the first eight days of life, we have chosen two for demonstration, that of the quietest baby and that of the most vociferous. In addition, one chart is shown to illustrate the hourly crying per average baby in the nursery. Fig. 1,*A* is that of the baby who cried the least during his hospital stay, a total of 386 minutes for the eight days, or 48.2 minutes per day. Fig. 1,*B* is that of the baby who cried the most, 1,947 minutes during the eight days, or 243 minutes per day, five times as much. Fig. 2 shows the average hourly crying per infant during the eight days, a total of 936 minutes, or 117 minutes per day.

The general distribution of crying with its periodic daily high points shows similarities, especially in the last four days in most charts. One can detect an increase of crying as the feeding hours are approached with a relative lull in between. The amount of "relative lull" depends in a rough way on the amount of nursing care given to the children. We notice that besides these

fluctuations there is a tendency for two peaks to appear, higher than any others through the day and centering around 6 P.M. and midnight. These can be seen in the individual charts and are most consistent in the average graph for the entire eight days. As already mentioned in the paper on the community phase,[1] the prolonged crying period at 6 P.M. is caused by lack of synchrony between nursery and floor routines. The babies have to be in the nursery by 2 P.M. because of visiting hours, a fact which advances the 2 P.M. feeding time to 1:15 or 1:30 P.M. Since the 6 P.M. feeding hour, unfortunately, had to be postponed because of the mothers' dinners, a feeding interval of five or six hours occurred, which resulted in the prolonged crying at 6 P.M. recorded in the graphs.*

It is easily seen from Fig. 1,A and B, showing minimal and maximal crying, that one baby may cry much more than another for the same type of cause.

Aside from the actual length of crying time and its distribution through the day, observations were made on the pattern of crying during the first twenty-four or forty-eight hours. It was observed that many infants expressed themselves by very short sounds, like short high-pitched grunts, which appeared in groups of ten to thirty successively, without ever culminating in

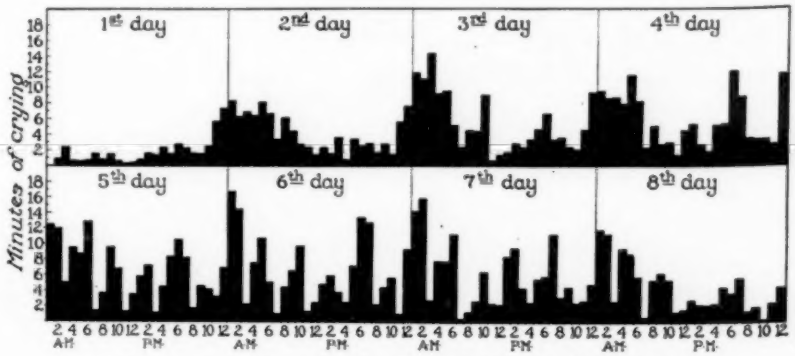


Fig. 2.—Crying chart—average of fifty babies—first eight days.

actual crying. Such sounds were noticed through the whole hospital stay but they were almost the only vocal expression of some babies for the first twenty-four to forty-eight hours. Just as large a group, however, commenced life with immediate, persistent, and intense crying. This pattern did not seem dependent on the total crying of the individual infant, as it occurred in the "quiet" as well as in the more persistently crying babies.

Frequency Diagram.—Having established the marked variation in amount of crying time exhibited by different babies, from 386 to 1,947 minutes, it seemed worth while to study a frequency curve showing the distribution of the fifty babies in relation to their total crying minutes. This shows the majority falling in the middle range (Fig. 3).

The Average Crying per Baby per Day.—From a practical standpoint it may be of some interest to observe the curve resulting when we plotted the average minutes of crying per day for the eight consecutive days in the hospital (Fig. 4). Here we found a smooth curve, rising from birth to the fourth day at a rather steep angle. From the fourth to the sixth day it remained at a fairly even level, to decline more abruptly thereafter. However, a very dif-

*This discrepancy was promptly rectified by having the mothers' trays sent up at 5:30 P.M.

ferent picture appeared when we attempted to superimpose the fifty curves of each baby on one chart. This showed a wild crisscross of seemingly unrelated lines, out of which it was impossible to read any tendency toward rhyme or reason. Much less were we able to reproduce it here. To demonstrate the difference, then, between an "average" curve and that of an "individual" baby we superimposed a typical curve of one infant in Fig. 4. Instead of the smoothness of the average, the curve of the individual baby climbs and falls in an irregular manner.

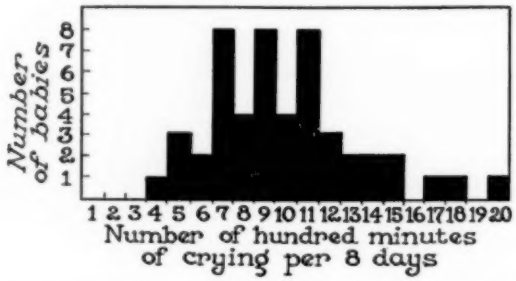


Fig. 3.—Distribution of fifty babies arranged according to total crying minutes—first eight days.

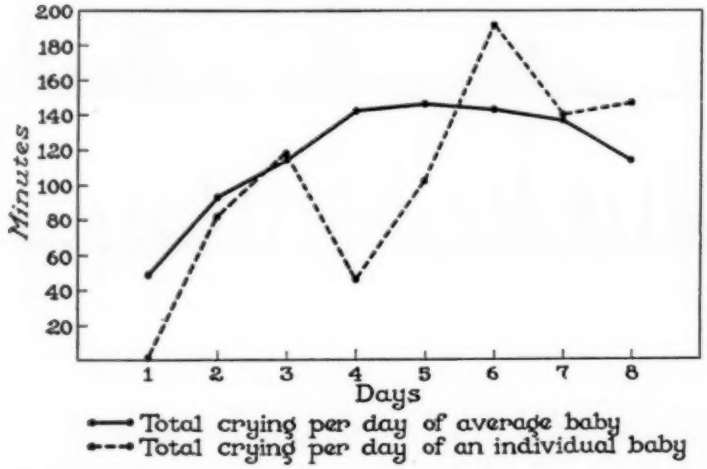


Fig. 4.—Crying per day in minutes. Average baby compared with individual.

Crying in Relation to Feeding and Weight Gain.—In order to study the relation of crying to feeding and weight gain we charted these three factors for each of the fifty babies. Examination of these charts did not lead to any simple conclusions. They seemed to be rather evenly divided into two groups, those which seemed to show a relationship and those which did not exhibit any correlation between food intake and crying. Out of the set of fifty, two typical charts are reproduced, each demonstrating a type (Fig. 5).

In Fig. 5,*A* a definite increase in food intake is accompanied by an obvious fall in the amount of crying. A slight decrease in food supply on the seventh day shows a simultaneous rise in crying, followed by a correlated divergence of the curves on the eighth day. However, although food intake and crying seem related there does not seem to be any similar correlation between weight

gain and crying in this chart. The crying increases and falls independently of the weight gain.

In Fig. 5,*B* the decreased and increased food intake curve is parallel with that of the fall and rise in crying activity and therefore does not suggest any rational correlation. Also, here again, there is no reciprocal relationship between weight gain and crying.

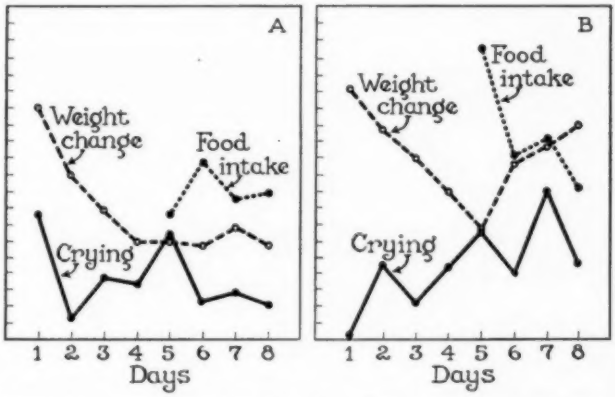


Fig. 5.—Superimposed curves of crying minutes, weight fluctuation, and food intake (two babies).

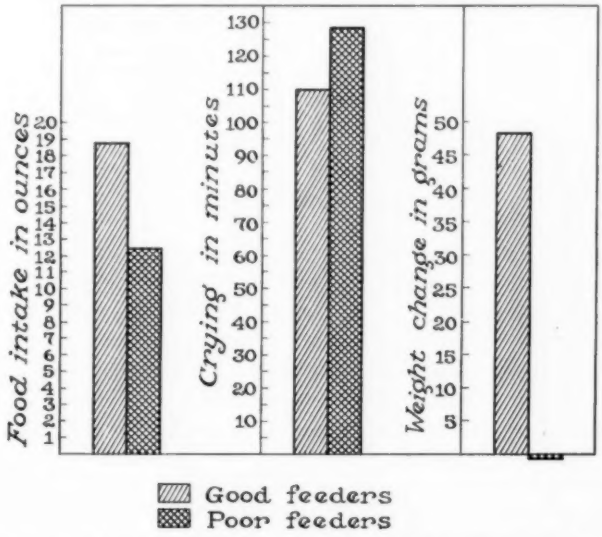


Fig. 6.—Reduction in crying (center) noted when good feeders are compared with poor feeders as shown by weight and food intake data.

Since this attack on the problem failed to show a consistent relation between food intake and crying, we tried another method. The ten babies with the best and the ten with the poorest feeding histories were compared. Scatter diagrams were made of crying and food intake in both of these groups but no correlation was demonstrable in either group.

Therefore, another attempt was undertaken to show that the amount of food taken would reduce the crying time. In the two groups defined in the

previous paragraph data were estimated per baby per day as to (1) the amount of food taken in ounces, (2) the weight fluctuation in grams, and (3) the amount of crying in minutes. This resulted in our ability to demonstrate (Fig. 6) a reduction of 17.8 minutes (15 per cent) of crying per day in the babies with good feeding histories. This seems of some significance, but, as our number of babies compared was small (ten in each group), the result cannot be considered of statistical importance. Fifteen per cent reduction in a large number would have been definitely significant but in only twenty babies it is merely an indication.

Causes of Crying.—As mentioned before, the recorded causes of crying were only an estimate dependent on the judgment of the observer and, therefore, cannot be considered absolutely accurate. Nevertheless, the information obtained should be of some clinical value as an approach to the problem of neonatal crying in hospital nurseries.

The causes observed were hunger, vomiting, soiled or wet diapers, and unknown reasons. Our method of investigation was as objective as possible. A prolonged, intense crying spell in a kicking infant at feeding time, sucking on his fingers or fist, was noted down as hunger. A crying child, lying in his vomitus or in soiled or wet diapers, was charted according to the apparent reason. The rest of the crying was charted as due to unknown reasons. The number of minutes of crying ascribed to each cause was calculated and the results shown in Table I were obtained.

TABLE I. MINUTES OF CRYING FOR EACH CAUSE

BABIES (NO.)	DAYS (NO.)	CAUSES OF CRYING				
		A HUNGER	B VOMITUS	C SOILED DIAPERS	D WET DIAPERS	J UNKNOWN REASONS
50	8	16,193.5 (35.5%)	214.5 (0.5%)	3,799.0 (8.3%)	9,359.5 (20.6%)	16,005.5 (35.1%)
50	1	2,024.2	26.7	474.8	1,169.9	2,000.6
1	8	323.9	4.3	76.0	187.2	320.1
1	1	40.5	0.5	9.5	23.8	40.0

Hunger and "unknown causes," according to our estimate, then, were the most important reasons for the crying of our babies. "Unknown causes" may seem to have a surprisingly high incidence but, if one remembers that infants at birth are individualists and that present nursery routines are not adapted to efficient individual care, it is understandable that we could be at a loss to explain many of these expressions of unhappiness.

Because we suspected that urgent fundamental needs would probably be expressed by more prolonged, continuous crying than that provoked by matters of less vital importance, we calculated the number of *periods* as well as the number of minutes of crying for each single cause (Table II). Our results confirmed this possibility, for the number of crying spells due to hunger dropped below that for "unknown reasons"; that is, the hunger cries were of longer duration than those due to unknown reasons.

COMMENT

In our consideration of the neonatal crying problem we have assumed that the cry of a newly born baby is a reflex protective mechanism used as a signal of need to whoever may attend him. As such, it becomes a useful attribute, one which, if ignored, may lead to harmful omissions in the baby's care. It is quite evident that many different stimuli, both from within and from without,

may suffice to trip the central automatic switch which turns on the cry. Hunger, chilling, bright lights, irritation of the skin from wet or soiled diapers, peristaltic movements, vomiting, bowel or bladder evacuation, loud noises, or loss of equilibrium may be listed among the generally accepted causes. Perhaps, to be complete, we should add such more or less negative factors as need for fondling and lack of rhythmic motion.

In studying the use of the cry by the individual babies we found marked differences. Some put up a vigorous, earsplitting objection for apparently trivial reasons; others seemed more phlegmatic and were perhaps less efficient. We are not prepared to say whether this is a matter of inherent disposition, of varying thresholds to stimuli, or of some other attribute of the baby but, at any rate, the fact of individual differences stands out clearly.

But no matter how much or how little the particular baby cries, one constant relationship is evident in our charts, the reciprocal effect of nursing care. The more care, the less crying.

To our great surprise it turned out to be a difficult matter to relate food intake and weight gain to the amount of crying. Even after persistent effort, the correlations that we were able to make between these factors were suggestive but not statistically significant. This result, however, was probably due more to the fact that in our preliminary thinking we underestimated the importance of other less obvious causes than that we overestimated that of hunger. If we had been able to chart crying due to hunger separately and then to compare the amount of hunger crying before and after the establishment of lactation, a very different picture might have appeared.

TABLE II. NUMBER OF CRYING SPELLS FOR EACH CAUSE

BABIES (NO.)	DAYS (NO.)	CAUSES OF CRYING				
		A HUNGER	B VOMITUS	C SOILED DIAPERS	D WET DIAPERS	J UNKNOWN REASONS
50	8	2,760.0	45.00	737.0	1,630.00	3,295.0
50	1	345.0	5.60	92.0	203.80	411.7
1	8	55.2	0.90	15.7	32.50	65.9
1	1	6.9	0.11	1.9	4.07	8.2

The most clear-cut result of our study of the causes of neonatal crying in the individual baby is a demonstration of the importance of unknown reasons. In total minutes of crying this group of reasons closely approaches the amount for hunger and in the number of crying spells it exceeds it.

When we take into account the unique situation of the newborn infant and the probable list of these unknown causes, we should not be surprised at this result. During intrauterine life the fetus becomes adjusted to a quiet, dark, warm, aquatic environment characterized by considerable rhythmic movement and absolute freedom from any responsibility in providing himself with food or oxygen. Immediately after birth his sensations are assailed by considerable noise, bright lights, cool, dry atmosphere and relatively little rhythmic movement and he is obliged to begin active participation in matters of oxygen and food intake, digestion, and elimination. It would be strange if, in the face of all of these major changes, he did not use his protective cry freely to register his adverse reactions to many sorts of unaccustomed stimuli. Because there are so many stimuli, the one factor of hunger, while still important, may well become less dominant in the crying picture at this time.

We, therefore, feel that in order to modify this situation in which we find new babies protesting violently for an appreciable part of their neonatal life—

and an overwhelming proportion of their waking hours—it will be necessary to pay more attention to these unknown causes in addition to perfecting our methods of routine care. This will probably mean more nurses on the job. It will also mean individualization of the management of each baby and the provision of closer contact with nurse or mother during the neonatal period.

SUMMARY

A controlled study on crying of fifty individual babies was made in a hospital during April, 1944. Four observers took turns in recording the amount of crying in minutes and the estimated causes of the crying.

The amount of crying for the baby with the least crying activity was 386 minutes during eight days, or 48.2 minutes per day. The baby who cried the most totaled 1,947 minutes during eight days, or 243 minutes per day. The average crying per infant amounted to 936 minutes during eight days, or 117 minutes per day.

A definite correlation between crying and nursing care was noted: the more care, the less crying.

The distribution of the total crying time of the fifty babies was bell-shaped.

A graph of the crying of the average baby per day for eight days resulted in a smooth curve, while that of any individual infant climbed and fell in an irregular manner.

Three different methods were used to evaluate the relation of crying to weight gain and feeding. The results were vague, except for that of the last method, which showed 17.8 minutes less crying daily in favor of the good feeders.

An attempt was made to estimate the causes of crying. Obvious causes, such as hunger, vomiting, soiled and wet diapers, and unknown reasons, were tabulated in minutes and number of spells.

The most clear-cut result of our study of the causes of neonatal crying is the demonstration of the importance of unknown reasons. In total minutes of crying this group of reasons closely approaches the amount for hunger and in the number of crying spells it exceeds it.

REFERENCE

1. Aldrich, C. A., Sung, Chieh, Knop, Catharine, Stevens, Geraldine and Burchell, Margaret: The Crying of Newly Born Babies: I. The Community Phase, J. PEDIAT. 26: 313, 1945.

A CASE HISTORY OF TWINS BREAST FED ON A SELF-DEMAND REGIME

GENEVIEVE TRAINHAM, B.A., R.N.,* GRACE JONES PILAFIAN, B.A.,†
AND RUTH M. KRAFT, M.D., PH.D.‡
DETROIT, MICH.

WE ARE presenting the case history of the first thirteen months of life of a pair of twins, male and female, breast fed according to their own demands from the third week of life. Other aspects of their care were based on the same philosophy, but in the present account we have emphasized the feeding history.

There have appeared in the literature several reports of self-regulated infant feeding schedules.[3, 6] In our experience the self-regulation regime for infants, especially for feeding and sleeping, is increasingly popular with parents, who report happy babies and readily adjusted households when such a system is in practice. However, there still prevails much skepticism in the minds of many members of the medical profession as to the practicality and wisdom of such a philosophy of infant feeding and care.

We believe with Gesell and Ilg,[4] Aldrich and Aldrich,[1] and Senn and Newill[5] that the cultural adaptation of infants may be facilitated by early recognition of and adherence to individual needs. We present the case of Peter and Sherry, therefore, because we feel that their superior development lends some support to this view, as their good feeding history and satisfactory growth demonstrate the practicality as well as wisdom of a self-demand regime, even for twins.

HOSPITAL HISTORY

The twins were born in the Woman's Hospital. Labor was induced by the obstetrician and a normal delivery followed. Peter, weighing 8 pounds, 5 ounces, was born at 4:40 A.M.; Sherry, weighing 5 pounds, 9½ ounces, was delivered four minutes later by breech extraction.

The self-demand schedule was not initiated at once, for, during their stay in the hospital, the twins were fed on a four-hour schedule which fitted into the hospital routine. Twelve hours after birth Peter, the larger of the two infants, was put to the breast. For the first three days he nursed at 10 A.M., 2 P.M. and 6 P.M., and thereafter, when milk flow was established, at 6, 10, 2, 6, and 10. A formula was given in the nursery if food was demanded at 2 A.M., so that the mother was not disturbed from 10 o'clock at night until 4:30 A.M. On the seventh day Peter averaged 3 ounces of milk at a feeding and, on the ninth day, 4½ ounces. Weighing before and after feedings showed, further, that Peter obtained as much as two ounces of colostrum at one nursing during this period, and that during the rest of the stay in the hospital he took on one occasion as little as 1½ ounces, but at many nursings as much as 5 ounces.

On the fourth day Peter weighed 7 pounds, 12 ounces (lowest weight), but, when discharged from the hospital on the thirteenth day, he was back to 8 pounds, 4½ ounces, just one-half ounce less than his birth weight.

*Assistant, Infant Laboratory, Merrill-Palmer School.
†Mother of the twins.
‡Acting Chief of Department of Pediatrics, Woman's Hospital.

At first, Sherry, the smaller of the twins, although brought into her mother's room whenever Peter came to nurse, was fed in the nursery a formula of ⅓ evaporated milk, ⅔ water, and 5 per cent Dextri-Maltose, of which she took from ½ to 2 ounces at a feeding. At 10 P.M. on the sixth day she was put to the breast and obtained 1 ounce. Thereafter the formula was discontinued, except when demanded during the night, and Sherry nursed before or after her brother, at 6, 10, 2, 6, and 10. The first day on the breast (the seventh day of life) she averaged 1¼ ounces at a feeding and on the tenth day of life 2¼ ounces. While in the hospital she took from 1¼ to 3¼ ounces at a feeding.

Sherry's weight dropped from 5 pounds, 9½ ounces at birth to 4 pounds, 14 ounces on the third day. The following day, however, she began to gain, and, when discharged from the hospital weighed 5 pounds, 10 ounces, or ½ ounce more than at birth.

INITIATION OF SELF-DEMAND

The pediatrician, who followed the infants from the day of birth, when discussing the care of the infants with the mother found her to be entirely in agreement with a self-demand regime. Even before pregnancy the mother had become interested in the principles of self-demand through a friend who had nursed her second baby in this way. Her interest had been furthered by reading books by Aldrich and Aldrich[1] and by Gesell and Ilg.[3, 4] When mother and babies, all three in good condition, were discharged from the hospital on the thirteenth day, the mother was instructed to feed the babies only when they waked and demanded to be fed. Accordingly, the hospital schedule was followed for the 6 P.M. feeding on that day, but thereafter the infants' own demands were respected.

The mother found that it took time and thought to know when a cry indicated hunger and when it meant some other discomfort. Before feeding either infant, the latter possibility and the time interval since the last feeding were checked. The same baby was never fed twice in less than one-half hour and ordinarily the interval was not less than one and one-half hours. The degree of insistence in the infant's cry was an important guide.

NOTES CONCERNING THE MOTHER

General.—The profession of Mrs. P., the mother of the twins, is architecture and she had worked until ten weeks prior to delivery. She is 5 feet, 5 inches tall and weighed 130 pounds at the beginning of pregnancy. At the time of the birth of the twins, her first babies, she was thirty-five years of age and had been married for three years. As a college student she had had some brief nursery school experience, but the care and feeding of the twins have constituted her first practical experience with infants.

Mrs. P.'s general health habits were good and there were no complications of pregnancy. Since the condition of the nipples and the dietary habits were directly related to lactation, we shall consider briefly these aspects of care during pregnancy and lactation.

Nipples.—Beginning from the seventh month of pregnancy, Mrs. P. oiled and massaged each nipple for approximately three minutes daily. Post partum the nipples were cleansed daily with soap and water and between feedings kept covered with sterile gauze pads. During the first three weeks Borofax ointment was applied after each nursing. When a cracked nipple threatened during the third week a heat lamp was used with good results, and the con-

dition cleared within forty-eight hours. During this period Mrs. P. continued to nurse the infants as usual.

Diet and Health Habits.—During pregnancy Mrs. P.'s daily diet consisted of:

1 to 2 oranges
1½ to 2 quarts of milk
2 eggs
1 generous serving of meat, with liver at least once weekly
Green and yellow vegetables and fruits in abundance, both raw and cooked
A whole grain cereal daily
A potato daily
3 squares of butter daily
Whole grain bread, 2 to 3 slices daily, and enough other starches and sweets to satisfy appetite

Quantities of desserts, cereals, and potatoes were cut somewhat toward the end of pregnancy, but Mrs. P. craved and ate large amounts in the early months.

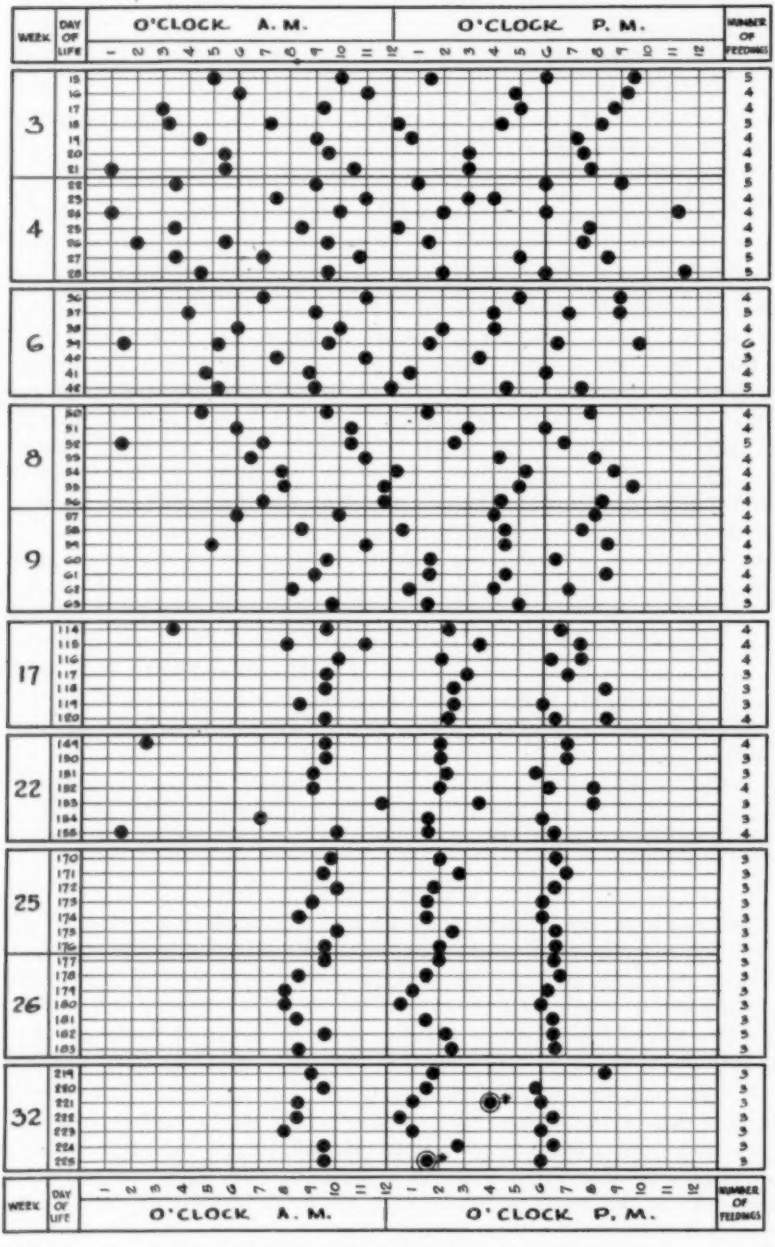
As was the case in these early months of pregnancy, after she began nursing the infants the mother found hunger very intense, sometimes to such a degree as to interfere with sleep. She, therefore, requested and received double portions of food on the hospital trays and from two to three quarts of milk daily. In addition, she drank from two to three quarts of water daily and a quart of other fluids. After her return home she had three light meals in addition to three regular ones. Her daily diet was virtually the same as that during pregnancy, except that liver was available about once every two weeks. Quantities of food eaten were increased to satisfy the larger appetite, milk was increased from two to three quarts, and during the first few months Mrs. P. also ate daily approximately twenty-four ounces of cooked whole grain cereal. Appetite decreased gradually as the number of feedings demanded by the twins decreased, and the amounts of food, especially the starchy foods, were cut accordingly. Throughout pregnancy and lactation Mrs. P.'s diet was supplemented with one Upjohn's Unicap daily and during lactation with six Feosol tablets daily.

Weight gain during pregnancy was 33 pounds. When discharged from the hospital Mrs. P. weighed 120 pounds and, thirteen months after the birth of the babies she weighed 125.

FEEDING RECORD

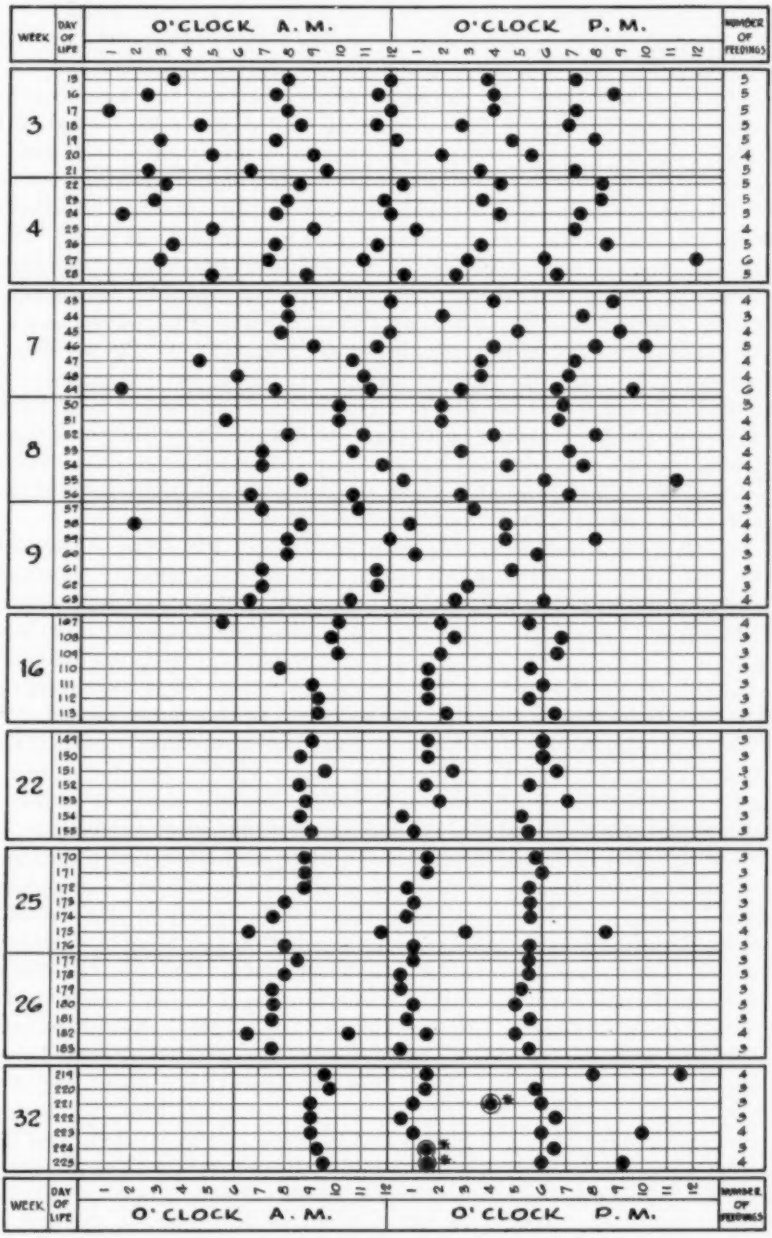
Self-Initiated Schedules.—Chart I shows the feeding schedule of Sherry during ten representative weeks. In the third and fourth weeks, the first two weeks on the self-demand schedule, there were seven 4-feeding days and seven 5-feeding days. There was very little regularity of feeding interval during these two weeks except in the evening feedings the third week, all of which fell between 7 and 9:30 P.M. The first 3-feeding days occurred in the sixth week, following the only 6-feeding day in Sherry's record (there was one 7-feeding day in the fifth week). The 4-feeding day predominated from the eighth week and a more regular time interval became apparent at the same time. The 3-feeding day was dominant in the twelfth week (not shown in the chart). From this time, there was only one 5-feeding day, but there was frequent shift from three to four feedings until after the seventeenth week. From this point the 3-feeding day was fairly consistent and when a fourth feeding was demanded it was usually an extra feeding which did not appreciably change the intervals between the usual three feedings during the day. At the end of the thirty-second week milk from a cup replaced the breast at the midday feeding.

CHART I. FEEDING SCHEDULE—FEMALE TWIN



*Cup feeding; on twenty-first day given not in response to demand for food but as an educational device to accustom infant to drink milk from a cup.

CHART II. FEEDING SCHEDULE—MALE TWIN



*Cup feeding; on twenty-first day given not in response to demand for food but as an educational device to accustom infant to drink milk from a cup.

Chart II shows representative weeks from Peter's feeding record. Considerable regularity of interval, at least for the four daytime feedings, was apparent even in the first two weeks on the self-demand schedule; and the preferred feeding times, 7 to 9 A.M., 11 A.M. to 1 P.M., 3 to 5 P.M., and 7 to 9 P.M. were quite different from those observed in the hospital during the preceding two weeks. The 5-feeding day was dominant during the third and fourth weeks with one 6-feeding day, eleven 5-feeding days, and two 4-feeding days. Besides one 6-feeding day in the fourth, fifth, and sixth weeks, the only other such day in Peter's record occurred at the end of the seventh week and was followed by a 3-feeding day. From the last feeding on the 6-feeding day until the first on the 3-feeding day, Peter slept more than twelve hours. During the remainder of the eighth week he demanded only four feedings daily. In the ninth week he had four 3-feeding days and three 4-feeding days. During the next six weeks (not shown in the chart) the schedule was somewhat irregular. There was only one 5-feeding day in this interval while there were eighteen 4-feeding days and twenty-three 3-feeding days. Of the one hundred and forty-six feedings during this six weeks' period only twenty-six were demanded between 6 P.M. and 6 A.M., approximately one-third of these between 6 and 11 P.M. and the remainder between 3 and 6 A.M. From the sixteenth week (Chart II) Peter's usual demand was for three feedings with only an occasional 4-feeding day. There was also great regularity in the timing of demands. Night feedings occurred rarely but were demanded a few times.

Acceptance of Breast Feeding and Sucking Time.—Peter, put to breast after the first twelve hours of life, as we have said, nursed immediately and readily, without any initial adjustment period. His pull on the nipple was very firm and strong and very comfortable for the mother. Her reaction to this first nursing was one of deep satisfaction and fulfillment, a response which was continued throughout Peter's entire nursing experience. She had a feeling of very close relationship to Peter and looked forward to nursing periods.

Sherry, as we have pointed out, was not put to the breast until the evening feeding on the sixth day. When the nipple was put into her mouth, she grasped it so tightly as to give her mother sharp discomfort. With subsequent nursings this improved slightly and Sherry took somewhat larger amounts at a feeding. It was very difficult, indeed, to determine when she was hungry and should be fed, because at first she cried after many feedings and quite frequently during feedings. Often during a feeding period she arched her back, cried, and refused to suck for several minutes, and, when she did nurse, she continued to cause her mother considerable pain. She also had difficulty in going to sleep at night, sometimes crying for thirty or forty minutes before she would relax into sleep. The parents considered these difficulties and, in consultation with the physician, resolved upon a concerted attempt to make Sherry feel more loved, more secure. She was so tiny, in contrast with Peter, that both parents, fearful of injuring her by too much handling, had held Sherry less than her brother. Sherry had been less responsive, too, than Peter, and, therefore, the latter was quite naturally talked to as well as played with more. From this time both parents made consistent efforts to divide attention equally when both babies were present. In addition, in the evening after Peter, who went to sleep easily, had been put to bed, Sherry was fondled a little and carried over her father's shoulder a few minutes before she was put down in her crib. The mother found, too, that if she consciously tried she could relax while nursing Sherry as she did when Peter was at the breast. Within a short time Sherry began to relax and was obviously happier and more

responsive. She was able to go to sleep with little difficulty and her nursing also improved. Her mother, with the greater satisfaction in nursing her, came to feel the same close bond with her daughter as with her son.

The actual sucking time* of each infant at each nursing was recorded for a thirty-five-day period from the thirty-first through the sixty-fifth day of life.† The fluctuations in the total daily sucking time for each baby for this period are shown by the graphs in Chart III. We were able to find no relationship between the length of sucking time and other factors.

Chart IV shows for both infants, for the same thirty-five-day period to which we have already referred, the frequency distribution of sucking periods. The median sucking time was 24.5 minutes for Peter and 21.6 for Sherry.

Introduction of Other Foods.—Other foods were introduced simultaneously into the diets of both twins as follows:

At 2 weeks oleum percomorphum and orange juice
At 2 months cereal
At 3 months vegetables
At 4 months puréed fruits
At 4½ months meat soup and egg yolk
At 6½ months scraped liver
At 8 months other scraped meats

At 5½ months Peter was advanced from egg yolk to a whole egg daily. This was tried with Sherry, but, because she developed a rash, egg was discontinued entirely. By 9 months she was taking small amounts of egg yolk again and by 10½ months a whole egg.

At no time did the introduction of a new food have any discernible effect either upon the intervals between breast feedings or the amount of time at the breast. However, it was observed that during their early experience with solid foods the babies frequently demanded to be nursed before accepting such food and would resume their nursing after its ingestion.

In every case a new food was given first in very minimum quantity and the amount stepped up gradually as the baby evidenced tolerance and acceptance. Occasional refusals or appetite variations were respected, but new foods have been generally well accepted by both babies, although Sherry did not accept cereal at once as Peter did. Both infants have usually evidenced good appetites. When, at 7½ months, the attempt was made to substitute junior chopped foods for puréed foods, these were flatly refused by both babies. The mother handled this by cooking whole carrots, whole beans, whole asparagus tips, and other vegetables, which could be finger fed by the babies themselves, and these were accepted enthusiastically.

Weaning.—It was possible to nurse both babies until weaning seemed desirable and at no time was any supplementary formula necessary.

Weaning was accomplished gradually, without pressure and with no strain on either mother or babies. In preparation, beginning from 3 months, orange juice and water were given from a cup. In the seventh month milk from a cup was offered occasionally between meals and usually accepted, though not enthusiastically. At the end of the thirty-second week milk from a cup was substituted for the breast at the midday feeding and readily accepted. Soon afterward Peter rejected the breast for the morning feeding also and a little

*Since deductions were made for time spent in bubbling the baby, etc., figures include only actual nursing time.

†This record was discontinued shortly after nine weeks because of the impracticability of keeping an accurate record of length of nursing time when solid foods were also being given.

CHART III. DAILY SUCKING TIME REQUIRED BY TWINS ON SELF-DEMAND (RECORD OF THIRTY-FIVE DAYS FROM THIRTY-FIRST THROUGH SIXTY-FIFTH DAY OF LIFE)

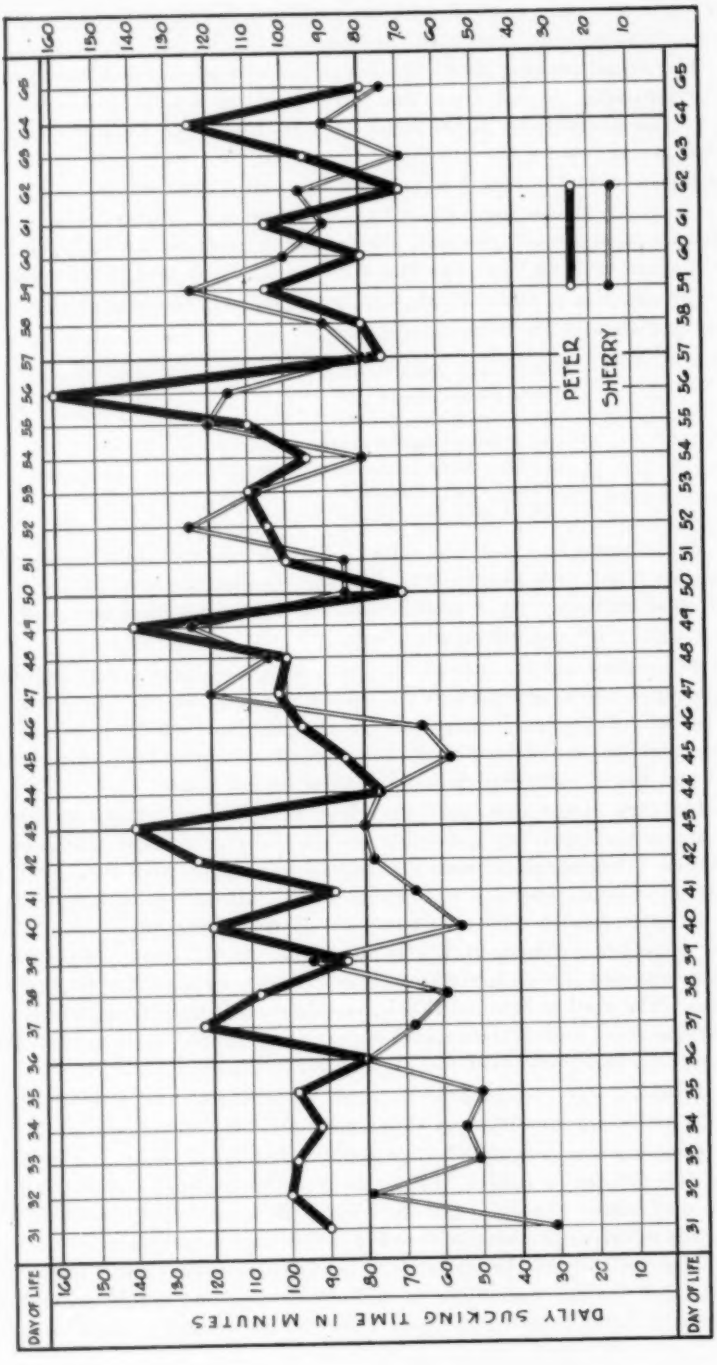
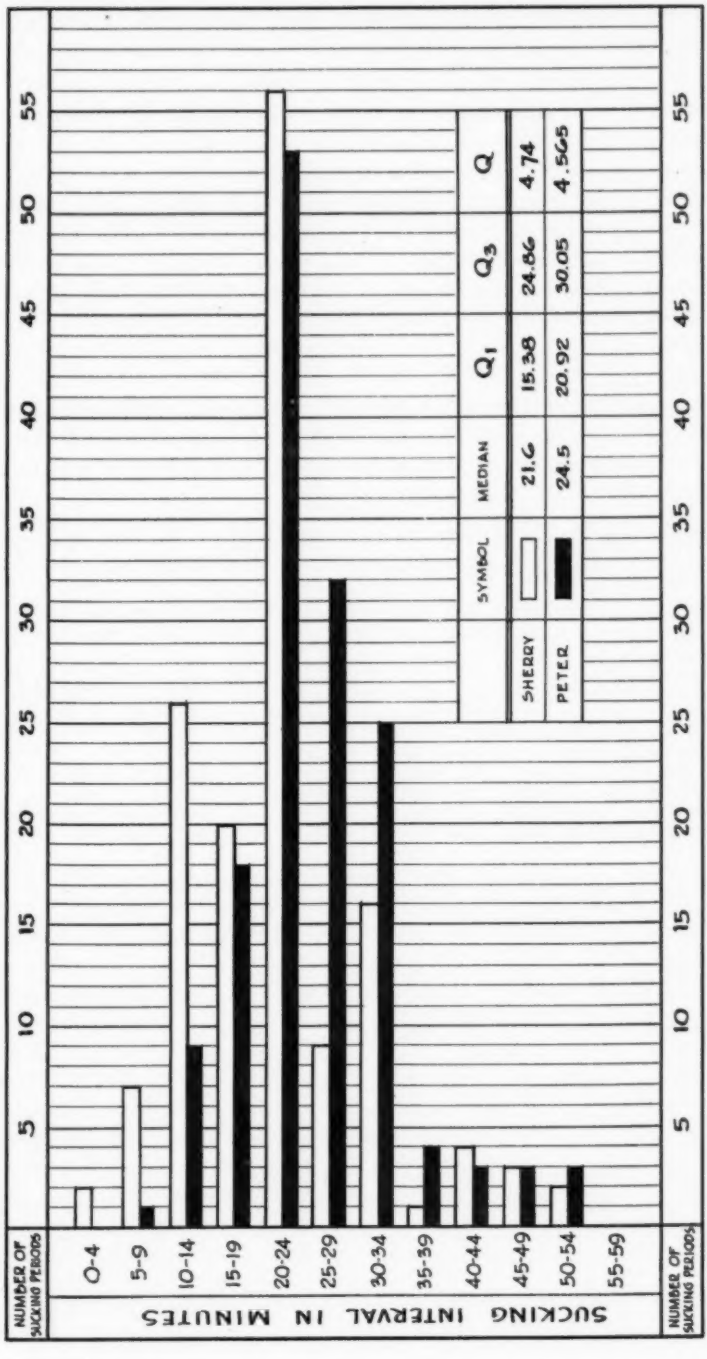


CHART IV. FREQUENCY DISTRIBUTION OF SUCKING PERIODS OF TWINS (BASED ON RECORD OF THIRTY-FIVE DAYS FROM THIRTY-FIRST THROUGH SIXTY-FIFTH DAY OF LIFE)



later Sherry, also of her own accord, gave up the breast at this time. Finally, the evening feeding at the breast was rejected by Peter at 9 and by Sherry at 10½ months.

ILLNESS HISTORY

Neither Peter nor Sherry has had any serious illness. Sherry had a cold at seven months and two days later Peter developed one. In each case, mild symptoms persisted for about ten days. Neither infant had any severe reaction to the usual inoculations against pertussis, diphtheria, tetanus, and smallpox. During the tenth month, and intermittently during the summer months, both infants had slight diarrhea. Otherwise, except for the transient rash mentioned earlier in reference to Sherry, the health histories of both babies have been negative.

GROWTH AND DEVELOPMENT

After discharge from the hospital no record was kept of the actual intake of either infant, but monthly measurements of physical growth showed them both to be making satisfactory progress. Table I summarizes gains made by each baby in weight, length, and skeletal age.

TABLE I. PHYSICAL GROWTH OF A PAIR OF TWINS BREAST FED ON A SELF-DEMAND SCHEDULE

	WEIGHT (POUNDS)	GAIN (POUNDS)	LENGTH (INCHES)	GAIN (INCHES)	S.A. (TODD[7])	GAIN (MONTHS)
Female Twin						
Birth	5.6		18.9			
3 months	9.7	4.1	22.0	3.1	2.0	
6 months	14.0	4.3	24.2	2.2	4.0	2.0
9 months	16.8	2.8	26.5	2.3	7.0	3.0
13 months	20.0	3.2	28.8	2.3	10.5	3.5
Male Twin						
Birth	8.3		20.0			
3 months	12.3	4.0	23.4	3.4	4.0	
6 months	16.5	4.2	25.8	2.4	6.0	2.0
9 months	21.3	4.8	27.8	2.0	9.0	3.0
13 months	25.0	3.7	30.1	2.2	15.0	6.0

TABLE II. DEVELOPMENTAL PROGRESS OF TWINS BREAST FED ON A SELF-DEMAND REGIME AS MEASURED BY GESELL DEVELOPMENTAL SCHEDULES[2]

	AGE			
	28 WEEKS		13 MONTHS	
DEVELOPMENTAL AREAS	D.A. (WEEKS)	D.Q.	D.A. (MONTHS)	D.Q.
Female Twin				
Motor	32.0	114	18.0	138
Adaptive	32.0	114	16.0	123
Language	32.0	114	16.0	123
Personal-social	34.0	121	16.5	127
Total schedule	32.5	116	16.6	128
Male Twin				
Motor	36.0	129	18.0	138
Adaptive	36.0	129	19.5	150
Language	32.0	114	18.0	138
Personal-social	36.0	129	18.0	138
Total schedule	35.0	125	18.4	141

Sherry's first incisor erupted at the age of 4½ months, and at 13 months she had sixteen deciduous teeth. Peter's first tooth erupted at 6 months and at 13 months he had eight incisors and two upper molars.

The developmental progress of the twins, as measured by the Gesell Developmental Schedules,[2] is shown in Table II. Both at 28 weeks and at 13

months each twin had a developmental age (D.A.) and a corresponding developmental quotient (D.Q.) showing advanced development.

Throughout their first thirteen months of life both babies have been very alert and eager for each new learning experience. Sherry has been outgoing, gay and friendly, and quick and aggressive in movement. Peter possibly has shown more imagination and understanding than his sister. He made friends slowly, but accepted people wholeheartedly when he was ready to trust them. Observing the two children at play it was apparent that Peter concentrated longer than Sherry. This difference was also noted during the 13-month developmental tests.

Sherry bit and chewed toys for some weeks at about six months of age, but has never sucked her thumb. Peter began to chew toys and to suck his thumb almost constantly at about four months. At 13 months he still sucked his thumb in moments of stress. Why Peter did considerable thumb sucking and Sherry none we do not know. Each baby, as we have pointed out, was allowed to nurse as often and as long as desired. There was little difference in the total number of feedings demanded by each, but Peter tended to nurse for longer intervals than his sister (Charts III and IV). Perhaps he began to suck his thumb because his sucking need was too great to be met while he satisfied his hunger. A possible explanation as to why the habit continued may lie in the fact that Sherry acquired locomotor skills ahead of her brother. She sat alone, stood supported, crept, and walked supported ahead of Peter and, finally, walked alone at 10½ months, while he did not walk unsupported until 11½ months.

From 9 months of age Peter had frequent periods of wakefulness during the night during which at first he demanded food and then later play and adult attention. This pattern began during the summer and was greatly improved after the beginning of cooler weather, but was not entirely eliminated at 13 months.

PROBLEMS IN SELF-DEMAND REGIME FOR TWINS

As is already evident, the mother was entirely sympathetic with the principles governing a self-demand schedule, and the father, too, was not only in agreement but also wholeheartedly cooperative. It seemed to Mrs. P., however, that this regime introduced a number of problems for which no solutions presented themselves, problems all largely inherent, perhaps, in the fact that she was nursing twins rather than a single infant.

First, on many occasions, the babies demanded to be fed at the same time. Infrequently, in real emergencies, Mrs. P. let them nurse simultaneously, one at either breast. This, however, was not as satisfying for the babies and was too fatiguing for the mother to be practiced often.

A second difficulty in nursing twins in this manner was the doubly frequent interruption of the night sleep of the mother during the first weeks. As late as the seventh month occasional feeding between midnight and 4 A.M. was demanded by Sherry and as late as the eighth month by Peter.

A third problem for Mrs. P. was that of getting out for adequate exercise and recreation, since the infants' schedules were unpredictable. As we look back on the records now there was adequate time, but it was impossible to know this in advance. This difficulty might have been obviated had the mother been willing to substitute an occasional formula for the breast and had she had some household help.

ADVANTAGES IN SELF-DEMAND REGIME

Aside from the physiologic advantages which the breast milk no doubt gave the babies, Mrs. P. is convinced that the psychological assets, both for the mother and babies, have far outweighed the few disadvantages.

Under this regime both babies, for the most part, seemed to feel secure, happy and contented, and there was, except for the brief interval with Sherry, already discussed, a minimum of crying. Sound sleep at night for both mother and babies actually began very early except for the very occasional demand for food in the night, as mentioned above. Without the slightest stress the number of feedings was decreased rapidly and at an early age by each baby to three daily. Weaning was also accomplished gradually and without difficulty. The mother, for her part, felt a real satisfaction in knowing that her babies were not denied food when they were hungry. This assurance contributed greatly to the confidence which both parents felt in their ability to care for their children, even though they were without previous experience.

Throughout their thirteen months, both Sherry and Peter have had other needs and demands, if reasonable, met as promptly as their needs for food. Surely such a regime has multiplied "those experiences of satisfied expectation which create a sense of security, a confidence in the lawfulness of the universe"[4, p. 56] and engender eagerness to explore all that an ever-widening horizon offers.

REFERENCES

1. Aldrich, Charles A., and Aldrich, Mary M.: Feeding Our Old Fashioned Children, New York, 1941, The Macmillan Company.
2. Gesell, Arnold, and Amatruda, Catherine S.: Developmental Diagnosis, New York, 1941, Paul B. Hoeber, Inc.
3. Gesell, Arnold, and Ilg, Frances L.: Feeding Behavior of Infants, Philadelphia, 1937, J. B. Lippincott Company.
4. Gesell, Arnold, and Ilg, Frances L.: Infant and Child in the Culture of Today, New York, 1943, Harper & Brothers.
5. Senn, Milton J. E., and Newill, Phyllis Krafft: All About Feeding Children, New York, 1944, Doubleday, Doran & Company, Inc.
6. Simsarian, Frances P., and McLendon, P. A.: J. PEDIAT. 20: 93, 1942.
7. Todd, T. Wingate: Atlas of Skeletal Maturation, St. Louis, 1937, The C. V. Mosby Company.

FURTHER RECORDS OF THE SELF-DEMAND SCHEDULE IN INFANT FEEDING

A Narrative by the Mother With Discussion by the Pediatrician

Frances P. Simsarian, M.A., and P. A. McLendon, M.D., F.A.A.P.
Washington, D. C.

NARRATIVE

IN 1942 we reported the first twelve weeks of a feeding program of an infant who was fed successfully on a self-demand schedule.[1] The program which utilized many of the techniques of Gesell and Ilg[2] was, in contrast to their records, commenced on the first day of life, this recording being possible due to the fact that the infant was kept in the hospital room with the mother during the hospital period.* Records were made by the mother as the feeding incidents occurred.

A similar program was carried out with the second infant who also was with the mother in the hospital room during the five-day hospital period. This infant like his older brother was offered the breast when he indicated hunger and was given only water in addition to the breast feedings. In the case of both infants the program of having the baby with the mother during the hospital period and of giving feedings upon demand of the infant was carried out because pediatrician and mother considered it an optimum program for infants; the study of feeding behavior was incidental to the program.

FEEDING INTERVALS

Throughout the discussion any nursing, however long or short, is considered a feeding. Feedings were terminated when the infant indicated satiety by withdrawing and refusing to reaccept the breast. If he demanded another feeding shortly, this was considered a new feeding.

Table I shows that Child H, the present infant under discussion, consistently demanded more feedings during the period under consideration than did Child J, both infants demanding considerably in excess of the number given to infants on scheduled feedings. Chart I plots the sleeping and the feeding intervals of Child H during the first two weeks of life. Table I compares the number of feedings of the two infants. As the chart indicates, the infant was awakened occasionally on the second, third, and fourth days of life if he did not spontaneously demand a feeding every four to five hours. This was done in order to stimulate the secretion of milk. It also seemed advisable to awaken him occasionally at bath time during the early days at home, if he did not spontaneously awaken for the sake of general household routine in a two-child family. The number of daily feedings during the first week ranged from none on the short first day of life to eleven on the fourth, fifth, and sixth days. From this point the trend with numerous fluctuations was toward a reduction in the number of daily feedings as shown in Table I. By the seventh and eighth weeks the infant was establishing a six-feeding day which had a rough framework of regularity during the daytime but which was more irregular for nighttime feedings.

*This arrangement was made possible through the courtesy of The George Washington University Hospital, and the cooperation of the obstetrician, Dr. Radford Brown.

TABLE I

WEEK OF LIFE	CHILD H		CHILD J	
	WEIGHT GAIN (OZ.)	TOTAL NUMBER OF FEEDINGS	WEIGHT GAIN (OZ.)	TOTAL NUMBER OF FEEDINGS
1	6½	56	4	54
2	9¾	59	4	50
3	13	57	11½	44
4	12	57	6½	43
5	7	51	6½	38
6	9	49	10½	44
7	9½	43	6	36
8	7	42	7½	36
9	9	37	3½	31
10	2½	38	8	36
11	10½	36	7½	35
12	5	36	6½	35

CHART I. FIRST FOURTEEN DAYS OF LIFE

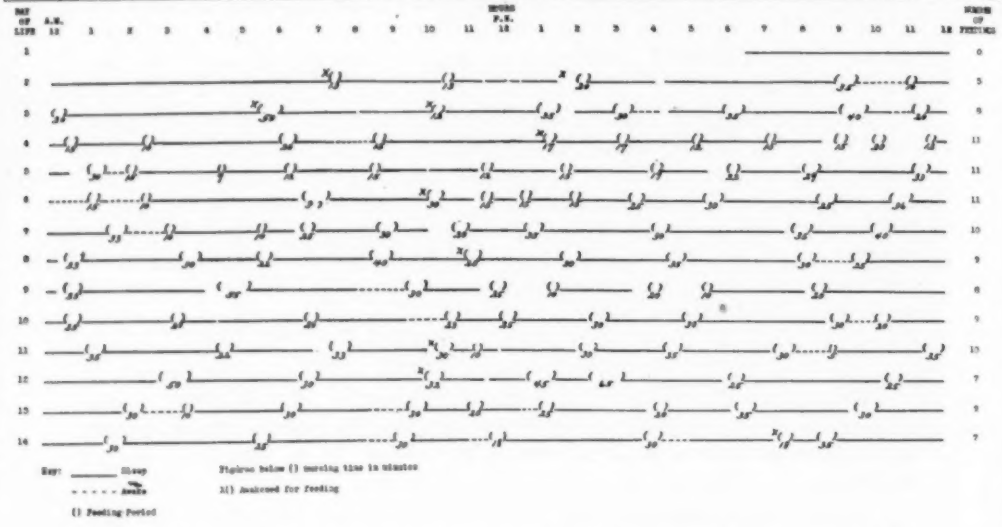


Chart II, which plots the sleeping and feeding intervals for successive Fridays during the period under consideration, shows the general trend in the development of a flexible feeding schedule. Like Child J, Child H tended to take his longest sleep after a 6 to 7 P.M. feeding. An unsuccessful attempt was made during the eighth week to eliminate the early morning feeding by awakening the infant for a late feeding. From the ninth through the twelfth week most days were five-feeding days with occasional six-feeding days. During the tenth week the first feeding was delayed to later in the morning by awakening the infant for a late evening feeding, and during this period the feeding and sleeping intervals regularized from day to day with very minor fluctuations, as shown on Chart III.

Initial nursings were easily accomplished with Child H as with Child J although the behavior accompanying feedings differed markedly with the two children. Child H was quiescent following birth and hence was not awakened for a feeding until he was about 13 hours old. He was sleepy and inactive when offered the breast, accepting it only slowly. Once sucking commenced it was vigorous and the hold was still firm after five minutes of nursing. He accepted the second breast immediately and sucked for eight minutes, the

CHART II. SUCCESSIVE FRIDAYS FIRST TWELVE WEEKS OF LIFE

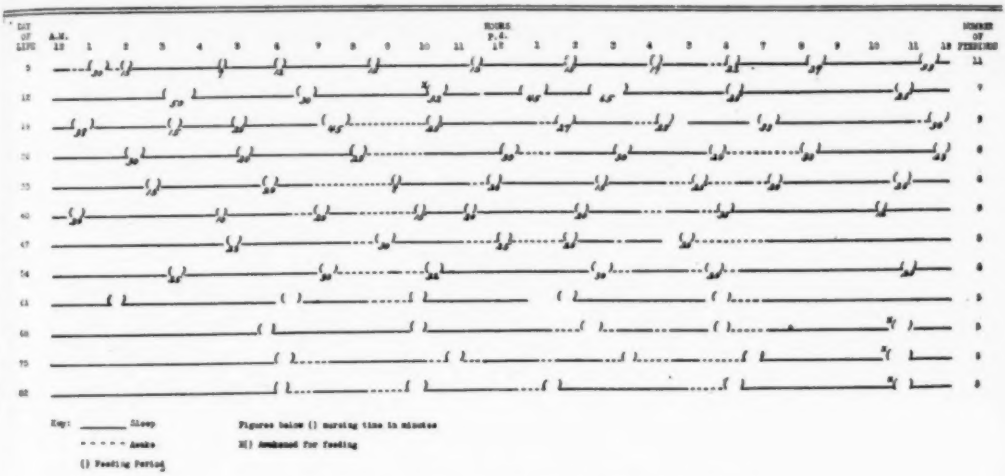
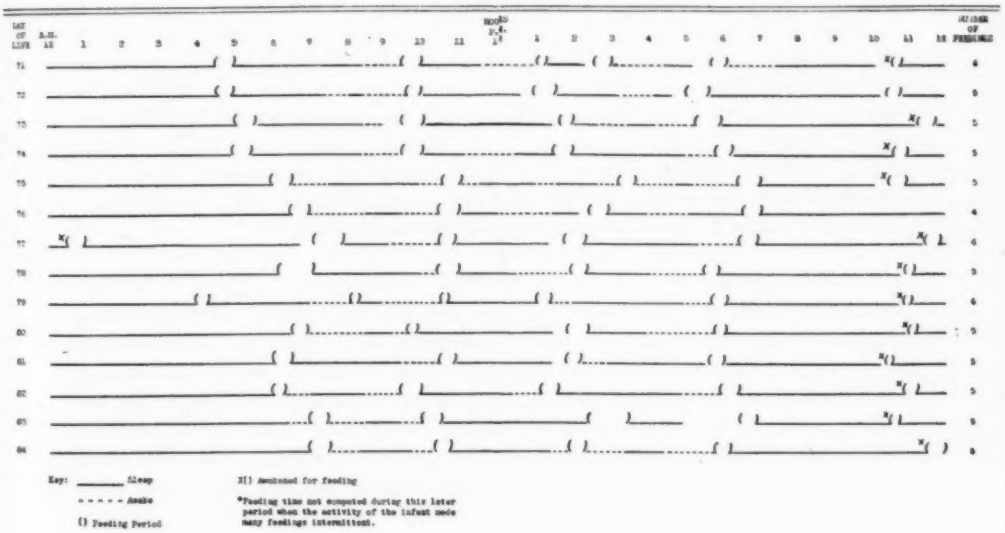


CHART III. ELEVENTH AND TWELFTH WEEKS OF LIFE*



sucking gradually tapering off into sleep. He took a few sips of water following the feeding, then expelled the nipple. Likewise, sucking at following nursings was vigorous with the infant gradually showing more activity in securing the nipple.

FEEDING CHARACTERISTICS

As compared with Child J, Child H spaced his feedings more evenly. He did not sleep for long periods, twelve hours at 9 weeks, as did Child J. During the first week of life and occasionally thereafter he took several feedings at short intervals as shown on Chart I, both infants being similar in having these so-called fussy periods during the night. Child J's behavior, mouthing, and seeking for the breast, suggested that his demands arose from hunger. Child

H, in contrast, did not give these indications of hunger frequently but, instead, occasionally cried as if in pain. The nursing was soothing to him and he settled down to sleep. These characteristics which appeared during the first days of life continued with both children with less marked intensity as they grew. The charts show that Child H continued to be restless and to sleep fitfully after some feedings throughout the period under consideration. His most relaxed sleep often preceded rather than followed a feeding, a direct contrast to Child J. Flickering smiles and weak stretching as indications of satiety appeared following feedings as early as the first week.

FEEDING TIME

Child H like Child J was allowed to remain at the breast until he indicated satiety. The nursing time during the early weeks is recorded in the charts. As he grew older many of the nursings were intermittent because of the activity of the infant or the need to expel air; thus it became impossible to record time. With Child H, as with Child J, there was marked variation in the amount of time spent in nursing from feeding to feeding. The extremely long and the extremely short nursings did not occur as often with Child H as with Child J.

WEIGHT

Both infants were given only breast feedings and sterile water in the days following birth. The picture of weight gain and loss with Child H is markedly different from that of Child J who lost more than the average amount of weight and gained more slowly. Child H was a smaller infant, weighing at birth 7 pounds, 12 ounces, and losing to 7 pounds, 3 ounces on the third day of life. He regained his birth weight by the tenth day and weighed 13 pounds, 7 ounces at the end of the twelve weeks under consideration. The weekly gain is shown in Table I. He was in good condition throughout.

SLEEP

Charts I, II, and III show the very gradual lengthening of the sleeping periods. Aside from the early days following birth, the infant rarely slept for as long as four hours during the first couple of weeks. By the third week periods of about four hours of quiet sleep began to occur more frequently, the longest sleeping periods usually occurring during the night. By the tenth week some periods of nine to ten hours of unbroken sleep appeared. The practice of awakening the infant for a late feeding produced the usual pattern of about twelve hours of sleep, broken only by the late evening feeding.

EVALUATION

The spontaneous feeding pattern of Child H here discussed, although differing in many details from that of his older brother previously reported, was similar in that both infants demanded more than the regime of six daily feedings during the early weeks of life and demanded the feedings at irregular intervals. By 10 weeks of age both had worked out a fairly regular program of five daily feedings, the program being entirely in accordance with their spontaneous demands except for the late evening feeding for which both were awakened to eliminate the early morning feeding. In view of the fact that most of our programs for handling infants and children are still based upon subjective evaluations of behavior, some admittedly subjective evaluations of the self-demand program in the case of these two infants is perhaps permis-

sible. In the first place, the mother liked the programs and she liked having the infants in the room with her during the hospital period. She enjoyed the opportunity this afforded to observe the spectacular changes of the first days of life, and for cuddling and loving the new baby. The mother preferred the extra trouble that was involved as compared to worrying about how the babies were doing in the impersonal atmosphere of the nursery. . Both infants were breast fed successfully. Feeding the babies when they cried and seemed hungry was easier and more satisfactory for this mother than permitting them to cry or trying by other devices to soothe them.

Ribble[3] has suggested that the well-mothered baby smiles and coos early. No records on this point are available for Child J. Child H was habitually smiling by the seventh week and began cooing during the eighth. Levy[4] has discussed the relationship of thumb-sucking to insufficient sucking experience during infancy. Extensive thumb-sucking appeared with Child J for a brief period from about 4 to 7 weeks, then without correction ceased, never to reappear. Thumb-sucking never appeared with Child H. Child J, now 4 years of age, has been consistently free of anorexia or other behavior disturbances.

SUMMARY

The feeding behavior of Child H during the first twelve weeks of life on a self-demand schedule has been reviewed with comparison to the behavior of Child J, previously reported. Both infants demanded more than the traditional six daily feedings during the early weeks of life but arrived at a fairly regular schedule of five daily feedings by the tenth week of life. Both responded to the program with continued evidences of good adjustment.

DISCUSSION

The narrative given supports a return to the more intimate relationship of the newborn infant and its mother. This can be brought about by having the baby in the room with the mother during their hospital stay and can be made practical, in most instances, by cooperation and understanding between the Obstetrical and Pediatric Departments. It is highly desirable that the mother and her newborn infant remain an entity long after the last labor pain.

It is my conviction that modern babies are born twice. There is the physical or somatic birth in the delivery room, followed some eight to twelve days later by the psychic birth at home. Not until this time has the mother been allowed to get acquainted with her infant. Usually twenty-four or more hours elapse after delivery before the infant is brought to the mother, and then so completely wrapped that only parts of the baby can be observed. This and subsequent visits are too short in duration for the mother to know much of the infant's reaction to feeding. There is also the unwritten admonition, "Not to be examined until reaching home." This can be excused on the grounds of possible infection, but it does not excuse the short visit which the modern nursery technique dictates—twenty-minute nursings at four-hour intervals. And if the baby is bottle fed the mother is fortunate if she feeds her baby once daily! Before leaving the hospital she has been assured by the pediatrician that the baby is strong, robust, and has no abnormalities, but she has not seen the body of her infant even for one fleeting moment.

During this period in the hospital the infant has slowly attained some consciousness of a new world. The mother has not been able to observe any part of this development. She is unfamiliar with the inevitable awakening of her infant. During the few minutes that the infant is allowed in her room

she has observed only a minor part of this phenomenon. While this hospital period is only a fleeting moment in the infant's life, it is that period during which a mother needs to become acquainted with her infant for whom she will soon assume responsibility. She needs to observe the physical manifestations of pain, contentment, discomfort, satiety, hunger, as they express themselves in the baby's behavior. There is only one period in which this unfolding of life begins—there is only one period in which the mother can observe this. Close association during these early post-partum days can do much to impress the mother with her responsibility for breast feeding. The infant's first cry for food cannot help but strike a responsive reaction in the new mother. Every parent in the mammalian world responds to this call for survival—to no less degree in man. This responsiveness cannot be improved by clock-determined visits!

And what of the first waking moments in the infant's life? Does he feel that he has been deserted? Where is the warmth of his mother's body, the sound of an assuring voice? Who can say that he does not feel her absence? Certainly her soothing presence is his heritage.

In the modern hospital this heritage of the infant and the privileges of the mother are treated with a minimum of respect. No provision is made for the satisfaction of either of these psychic phenomena. Their satisfaction must await that rebirth at home, when so much has transpired in the interim. Babies and mothers have been sent home several days earlier than usual during the past two years. I have noticed there are fewer apprehensive calls on the telephone than previously. Is this because these babies are not the outspoken babies of 10 to 12 days of age of five years ago? Is the mother more emotionally adjusted to this younger, less wakeful infant?

There is another phase of this early relationship which is important. The impulse of the new mother during the first few days is to do something for her infant. There is an early impulse to care for and attend to his wants, which impulse is not satisfied, leaving her infant to be cared for in accordance with impersonal nursery routine. Childbirth is a normal procedure, but the average mother is led to believe that she has not the strength or ability to do anything for herself or her infant. Once this impression is fixed the tendency is to shun the use of her own judgment and decision in the future. This attitude in the mother is seen later in vacillating management of her children. Early management of schedules, feeding periods, and other minor cares of her infant can do much to foster a mother's confidence in her own judgment and ability. This can be done by more freedom allowed in early mother-infant companionship.

REFERENCES

1. Simsarian, Frances P., and McLendon, P. A.: J. PEDIAT. 20: 93, 1942.
2. Gesell, Arnold, and Ilg, Frances L.: Feeding Behavior of Infants, Philadelphia, 1937, J. B. Lippincott Company.
3. Ribble, Margaret A.: The Rights of Infants, New York, 1943, Columbia University Press.
4. Levy, David M.: Child Development 8: 99, 1937.

DIAGNOSIS AND MANAGEMENT OF SEVERE INFECTIONS IN INFANTS AND CHILDREN: A REVIEW OF EXPERIENCES SINCE THE INTRODUCTION OF SULFONAMIDE THERAPY

IV. Pneumococcus Meningitis

Alexis F. Hartmann, M.D., Frances M. Love, M.D.,
Dorothy Wolff, Ph.D., and Barbara S. Kendall, Ed.M.
St. Louis, Mo.

MENINGITIS due to the pneumococcus represents one of the gravest illnesses of infancy and childhood, carrying with it a very high mortality rate and exceeded among the more commonly occurring meningitides only by infections due to the tubercle bacillus and to *Hemophilus influenzae*. It is clear that the now available therapeutic agents, the sulfonamide drugs and penicillin, have reduced previous mortality and altered considerations of prognosis and treatment. Series reported previous to the advent of these drugs have shown a mortality approximating 100 per cent. In those cases in which recovery is claimed, careful analysis will usually bring out the doubtful basis for the diagnosis. In most instances the diagnosis was based on stained smears in which organisms thought to be pneumococci were seen and in which bacteriologic culture confirmation was lacking. There is no record, prior to the introduction of sulfonamides, in St. Louis Children's Hospital of recovery of a patient from a pneumococcus meningitis from whose spinal fluid organisms were grown.

Since the introduction of sulfanilamide in 1936 and up to the time of this writing, we have had under our supervision thirty-four cases of purulent meningitis due to infection by the pneumococcus. Of some interest is the difference in results obtained in treatment with the first of these drugs, sulfanilamide, and those obtained when later introduced sulfonamide drugs of broader coverage and greater therapeutic efficiency (beginning with sulfapyridine) were employed. The results of all cases of acute bacterial meningitis treated with sulfonamide drugs are tabulated in Table I on the basis of this comparison and cover the period from December, 1936, to November, 1944. These cases were managed by the pediatric service with help from the otolaryngologist, the bacteriologic laboratory and x-ray department when necessary, as were the cases in the first two papers of this series.

We are prompted to a detailed report of these cases since we have data not only on immediate treatment and prognosis but later follow-up, revealing interesting information regarding late sequelae and effects on mental development.

PROTOCOLS OF SULFONAMIDE TREATED CASES

Case 1 (Chart 1 and Table II).—This 12-year-old child, S. F., developed an acute upper respiratory infection on April 1, 1937. On April 7, there was nasal congestion with headache, and she began to vomit and to have fever. Headache and fever persisted, and the following day she began to complain of backache, dizziness, and abdominal pain. No chemotherapy was given. On admission to the hospital on April 13, the apparent seventh day of meningitis, she was found to be acutely ill, stuporous, and with extremely stiff neck

From the Departments of Pediatrics and Otolaryngology of the Washington University School of Medicine, and the St. Louis Children's Hospital.

TABLE I. TABULATION OF 234 CASES OF MENINGITIS (DEC. 1, 1936, TO NOV. 1, 1944, INCLUSIVE)

TYPE	BEFORE SULFAPYRIDINE		AFTER SULFAPYRIDINE	
	NO. OF CASES	PER CENT MORT.	NO. OF CASES	PER CENT MORT.
Meningococcus	12	33.3	100	7.0
Streptococcus hemolyticus	3	66.7	11	18.2
Pneumococcus	7	85.7	27	55.5
H. influenzae	3	66.7	30	83.3
B. proteus	1	100.0	1	0.0
B. coli			2	100.0
B. pyocyaneous			1	100.0
Staphylococcus and Streptococcus			1	100.0
B. coli and *Str. viridans*			1	100.0
Friedländer's bacillus			1	100.0
Atypical *H. influenzae* (penicillin sensitive)			1	0.0
"Sterile"	6	0.0	26	3.8*
Totals	32	59.4	202	28.4

*Single death due to brain abscess.

and back. There was an acute rhinitis with bilateral maxillary sinusitis, but no apparent otitis media or mastoiditis. Lumbar puncture revealed cloudy spinal fluid with 1,340 cells and numerous gram-positive lancet-shaped diplococci. These were considered to be pneumococci although they were never typed. Blood culture also showed growth of an unclassified pneumococcus. Treatment was begun with prontosil intramuscularly, a continuous intravenous infusion of dextrose and Ringer's solution, and continuous spinal fluid drainage by needle. The child became rapidly worse and died within twenty-four hours of admission. No autopsy was permitted.

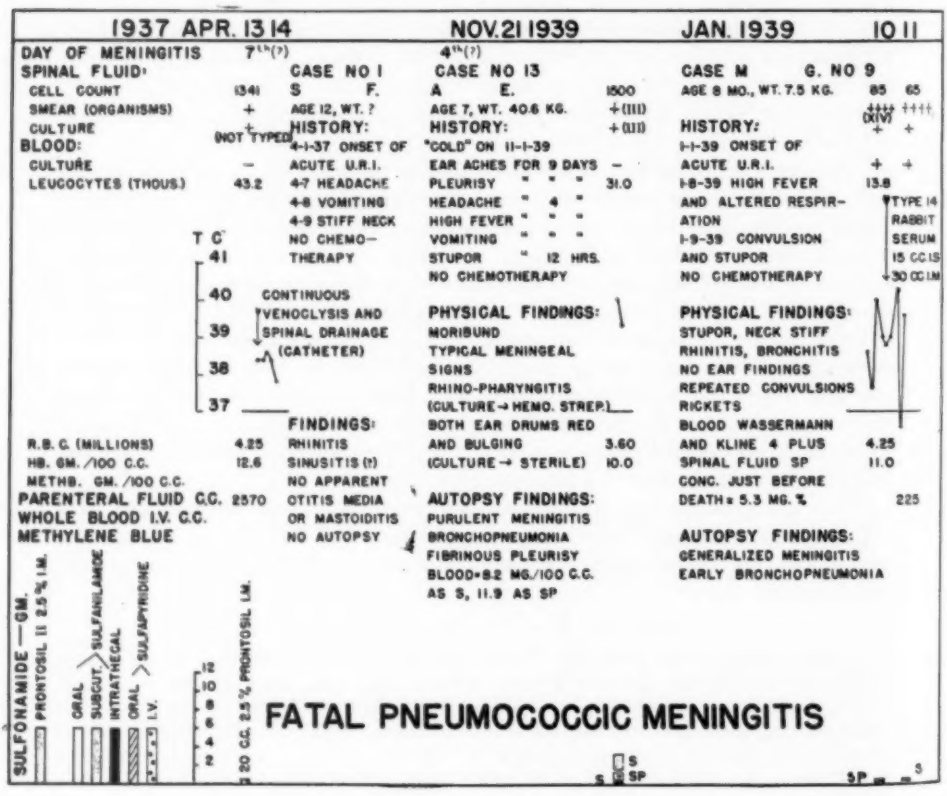


Chart 1.

CASE 2 (Chart 2 and Table II).—This 8-year-old girl, J. M. B., had had left otitis media and mastoiditis with left simple mastoidectomy some four years previously, following an attack of scarlet fever. She then had no further illness until two weeks before entry to the hospital on April 15, 1937, when she developed right otitis media treated by myringotomy. There had been no sulfonamide chemotherapy. On the day of entry, she began to complain of frontal headache and vomited several times and developed fever.

On entry she was found to be very acutely ill with a temperature of 40.5° C., but she was conscious, alert, and rational. The right ear was draining pus, and there was slight tenderness over the tip of the right mastoid process. There was definite rigidity of the neck and a bilateral positive Kernig sign. Lumbar puncture revealed turbid spinal fluid with 6,800 cells. No organisms were seen on stained smear, but culture grew pneumococci type III. The blood culture was sterile.

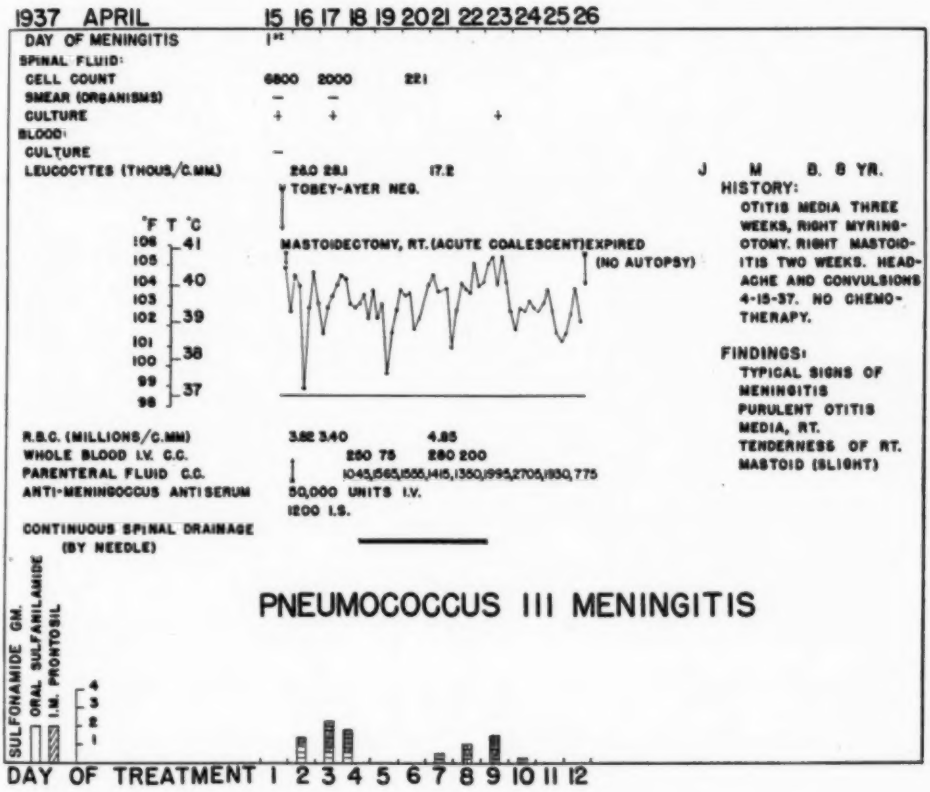


Chart 2.

On the first hospital day, a right simple mastoidectomy was performed, at which time a soft cortex was revealed with cells filled with granulation tissue. The exposed dura was gray in color, and there were some granulations on the wall of the right lateral sinus near the dural angle. Fifty thousand units of antimeningococcus serum were given intravenously on the second day before the real nature of the infection was established. Chemotherapy was administered postoperatively as prontosil intramuscularly and sulfanilamide orally. Supportive measures included a continuous intravenous infusion with dextrose and Ringer's solution and several transfusions of whole blood. Continuous spinal drainage was attempted by spinal needles without much success.

In spite of these therapeutic measures, the child's condition became steadily worse, and all spinal fluid cultures grew pneumococcus type III profusely. Following a continuous downhill course, the child expired on April 26.

TABLE II

Date of Admission	Case No.	History No.	Race	Sex	Age—Yr.	Body Wt. Kg.	Apparent Portal of Entry	Apparent Day of Meningitis When Treatment Was Started	Sulfonamide Therapy: Total Gm.	Sulfonamide Therapy: Total Days Administered	Sulfonamide Therapy: Gm. Before First Neg. Sp. Fl. Culture and Permanent Sterilization	Sulfonamide Therapy: Concentration Range in Mg. per 100 c. c. Blood	Sulfonamide Therapy: Concentration Range in Mg. per 100 c. c. Sp. Fl.	Other Therapy: Serum Route	Other Therapy: Serum Total Dosage	Other Therapy: Serum Day of Meningitis Administered
4-13-37	S. F. 1	N-611	W	F	12	?	U.R.T.	7th	IM 0.75 P	19/24	Never negative	—	—	—	—	—
4-15-37	J. B. 2	N-617	W	F	8	?	T.B. Blood?	1st	IM 6.4 P O 3.2 S	12	Never negative	—	—	Meningococcus Antitoxin IV IS	50,000 U 5 c. c.	1st
4-25-37	P. H. 3	N-670	W	F	9	25.0	T.B.	3rd	IM 1.0 P O 154.7 S IS 3.2 S SC 19.2 S	50	IM 1.0 P O 16.1 S IS 2.4 S SC 13.6 S	10.7	—	Meningococcus Serum IV IM IS	50,000 U 15 c. c. 15 c. c.	3rd
5-19-37	H. L. 4	N-728	W	M	4	15.0	T.B.	Developed while pt. was under treatment	O 19.4 S IS 4.3 S SC 34.4 S	18	Never negative	—	—	Type III Rabbit IS Repeat	20 c. c. 20 c. c.	18th 19th
12-6-37	A. R. 5	N-2208	W	F	2-2/12	13.3	?	Developed under treatment	O 10.3 S IS 0.9 S SC 5.5 S IV 1.3 S	14	Never negative	—	—	Polyvalent Pne. IM IM	10 c. c. 30 c. c.	Before detected
12-27-37	N. T. 6	N-2266	W	M	5	19.0	T.B.	10th	IM 2.0 P O 6.5 S IS 1.3 P IS 2.3 S SC 74.1 S	16	Never permanently sterile	1.6–21.3	1.6–5.2	IS IM IS IM IS	40 c. c. 40 c. c. 10 c. c. 30 c. c. 25 c. c.	12th 13th 14th
2-28-38	D. G. 7	O-460	W	M	10	28.0	U.R.T.	1st	O 217.1 S IS 1.1 S IVent 0.5 S SC 81.0 S	60	Never permanently sterile	5.5–17.0	5.1–10.1	—	—	—
12-26-38	R. M. 8	O-2574	W	M	5/12	7.8	U.R.T.	2nd	O 18.0 S O 22.0 SP	19	O 9.0 S O 4.2 SP	5.8–17.0	4.4–13.6	Type V Rabbit IS IM IS IC IS IS	20 c. c. 40 c. c. 18 c. c. 20 c. c. 15 c. c. 14 c. c.	3rd 3rd 4th 4th 5th 7th
1-6-39	M. G. 9	P-159	C	M	8/12	7.5	Blood stream?	2nd	O 1.3 SP R 1.5 SP Na IS 0.1 S	7	Never negative	4.6	5.3	Type XIV IS IM	15 c. c. 30 c. c.	2nd
2-28-39	C. A. 10	O-2466	W	M	7/12	6.8	Blood stream	2nd	O 1.0 S IV 1.5 SP	22/24	Never negative	—	—	—	—	—
5-24-39	R. U. 11	P-1101	W	F	6 da.	3.2	T.B.?	2nd	O 2.6 SP IV 1.1 SP	6	Never negative	1.5–9.4	—	Type I Rabbit IM IM	20,000 U 20,000 U	2nd 3rd
11-6-39	W. B. 12	P-2303	W	M	10	44.5	T.B.	6th	O 7.2 SP R 8.2 SP IV 0.5 SP	21	R 18.0 SP IV 5.0 SP	3.0–14.0	1.5–9.8	—	—	—
11-21-39	A. E. 13	P-2392	W	M	6	21.4	U.R.T.	4th	IS 0.4 S SC 1.8 S IV 1.0 SP	6/24	Never negative	8.2	—	—	—	—

U.R.T., Upper respiratory tract. T.B., Temporal bone. O, Orally. R, Rectally. IM, Intramuscularly. IS, Intraspinously. IV, Intravenously. IC, Intracisternally. IT, Intrathecally. IVent, Intraventricularly. SC, Subcutaneously. S, Sulfanilamide. Sp, Sulfapyridine. SMT,

CASE 3 (Chart 3 and Table II).—This 9-year-old girl, P. H., had a left simple mastoidectomy performed in 1932, when she was 5 years of age. The left ear continued to drain, however, and another operation was performed in 1935. The ear continued to drain intermittently. On April 23, 1937, she became acutely ill with headache, fever, and vomiting, and the next day her neck became painfully stiff, and she lapsed into a stupor. She was admitted to the hospital on April 25. No sulfonamide chemotherapy had as yet been administered.

On admission the child was comatose. Her temperature was 41.2° C. The right VI and VII intracranial nerves were paralyzed. Foul pus was draining from the left ear, and so much stenosis of the external canal was present that visualization of the eardrum was impossible. There were no external signs of mastoiditis on the left side. The spinal fluid was turbid, and in the stained smear organisms could be seen which were at first mistaken

TABLE II

Other Therapy			Bacteriological Data										Complicating Infections	Days of Hospital Stay	Outcome
	Mastoidectomy		Blood Culture				Spinal Fluid								
							Smear			Culture					
Spinal Drainage Days	Side	Day of Treatment with Sulfonamide	No. Taken	No. Pos.	No. Neg.	Day of Treatment When Last Positive	1st	Type	Day of Treatment When Last Positive	1st	Type	Day of Treatment When Last Positive			
C (2)	—	—	0	0	0	—	+ Many	I	Never negative	+	I	Never negative	Maxillary sinusitis	19/24	D
N (8)	Right	1st	1	0	1	—	0	—	Never negative	+	III	Never negative	Right otitis media and mastoiditis	12	D
—	Left	33rd	0	0	0	—	+ Few	—	5th	+	V	11th	Left otitis media and mastoiditis	53	R
—	—	—	1	0	1	—	+ Many	III	Never negative	+	III	Never negative	Maxillary sinusitis, mastoiditis, labyrinthitis, brain abscess	20	D
—	—	—	2	2	0	Never negative	+ Many	VII	Never negative	+	VII	Never negative	Pneumonia + empyema, left, bilateral otitis media	79	D
—	Left	1st	3	0	3	—	0	—	Never negative	+	III	Never negative	Left otitis media, mastoiditis, petrositis, and lateral sinus thrombosis	18	D
L (27) LP (2) C (2) 2ndL(11)	—	—	0	0	0	—	0	—	Never permanently negative	+	X	Never permanently negative	Entry by removal of nasal polyps, brain abscess, erosion of cribriform plate	60	D
—	—	—	2	1	1	2nd	+ Many	V	3rd	+	V	3rd	Bilateral otitis media, nasopharyngitis	33	R
—	—	—	2	2	0	Never negative	+	XIV	Never negative	+	XIV	Never negative	Syphilis, bacteremia bronchopneumonia	1	D
—	—	—	3	2	1	Never permanently negative	0	—	Never negative	+	XVIII	Never negative	Syphilis, bacteremia	22/24	D
L.P. Cis.P. Ven.P.	—	—	5	5	0	Never negative	+ Many	Not until culture	Never negative	+	I	Never negative	Bacteremia, bilateral otitis media	6	D
—	Right Left	1st 31st	3	0	3	—	+ Many	Not until culture	23rd?	+	I	3rd	Bilateral otitis media	45	R
—	—	—	2	0	2	—	+ Many	III	Never negative	+	III	Never negative	Bilateral otitis media	6/24	D

Sulfamethylthiazole. SPZ, Sulfapyrazine. SD, Sulfadiazine. ST, Sulfathiazole. P, Prontosil. Na, Sodium salt. L, Laminectomy. LP, Lumbar puncture. C, Catheter. N, Needle method. R, Recovered. D, Died.

for meningococci, proving later on culture to be the pneumococcus type V. The blood culture proved to be sterile.

Sulfonamide chemotherapy was started immediately with 2.7 Gm. of sulfanilamide orally and continued for the next four days as sulfanilamide subcutaneously and intrathecally and as prontosil intramuscularly. On the first day, meningococcal antitoxin was also administered. Prompt and continued improvement followed the institution of chemotherapy, and on the fifth day of treatment, the spinal fluid contained but 400 cells and was sterile. The intrathecal and subcutaneous administration of sulfanilamide were then discontinued, and the entire daily dose of 4 Gm. was given by mouth. A relapse promptly followed; fever became higher; meningeal signs returned, and the spinal fluid which had become clear and sterile again became purulent, and the pneumococcus V could again be

TABLE II—Continued

Date of Admission	Case No.	History No.	Race	Sex	Age—Yr.	Body Wt. Kg.	Apparent Portal of Entry	Apparent Day of Meningitis When Treatment Was Started	Sulfonamide Therapy: Total Gm.	Sulfonamide Therapy: Total Days Administered	Sulfonamide Therapy: Gm. Before First Neg. Sp. Fl. Culture and Permanent Sterilization	Sulfonamide Therapy: Concentration Range in Mg. per 100 c. c. Blood	Sulfonamide Therapy: Concentration Range in Mg. per 100 c. c. Sp. Fl.	Other Therapy: Serum Route	Other Therapy: Serum Total Dosage	Other Therapy: Serum Day of Meningitis Administered
1-20-40	C. K. 14	Q-189	W	F	5/12	6.6	U.R.T.	1st	O 95.4 SP IS 0.02 S IV 16.5 SP	34	Never negative	5.8-19.8	17.5	Type XVIII IS IS IS	50,000 U 100,000 U 100,000 U	18th 20th 22nd
2-15-40	M.A.S. 15	Q-333	W	F	8	20.8	U.R.T. (Fracture)	2nd	O 4.0 S O 81.0 SP O 254.0 SMT R 78.0 SP SC 0.4 S IV 11.0 SP	61	O 4.0 S O 65.0 SP O 92.0 SMT SC 0.4 S R 62.0 SP IV 11.0 SP	1.1-12.4	0.8-7.1	Type VI IM IV Staphylococcus IM	40,000 U 40,000 U 40 c. c.	28th 28th 27th
8- 1-40	R.M. 16	Q-697	W	M	3	16.3	Brain abscess	—	—	—	—	—	—	—	—	—
4-14-41	C. M. 17	R-735	W	M	3/12	4.7	Blood stream	2nd	IV 0.5 SP	12/24	Never negative	—	—	Meningococcus IM	15 c. c.	2nd
7-17-41	P. Z. 18	P-2312	W	F	1-10/12	3.8	Blood stream	3rd	IS 0.4 SP IV 1.2 SP	2	Never negative	17.0	9.1	—	—	—
8-27-41	W. W. 19	R-1900	W	M	6/12	5.8	Blood stream	4th	O 1.08 ST O 1.08 SP IV 0.5 ST	2	Never negative	—	5.0	—	—	—
12- 1-41	J. H. 20	R-2636	W	F	3/12	4.9	T.B.	1st?	O 7.5 ST O 86.5 SD IV 2.0 SD	27	O 7.5 ST O 34.5 SD IV 2.0 SD	3.5-3.84	0.8-19.3	Type XI Rabbit IM IVent IVent	100,000 U 50,000 U 50,000 U	1st 16th 17th
12-30-41	R. K. 21	R-2836	W	M	5	14.3	U.R.T.?	1st	O 42.3 SD IV 7.5 SD	16	IV 4.2 SP	6.9-57.4	20.6-37.2	Type IV Rabbit IV IS	100,000 U 50,000 U	1st 2nd
1- 2-43	B. W. 22	T-103	W	F	7	20.0	U.R.T.	2nd	O 98.3 SD IV 6.5 SD	10	O 19.3 SD IV 6.5 SD	2.2-45.9	0 -27.6	—	—	—
2- 1-43	D.M.P. 23	T-322	W	F	1-5/12	6.5	Blood stream	?	O 2.0 SD IV 1.0 SD	2	Never negative	7.5	—	Antipertussis IV IM	3 c. c. 7 c. c.	5th
2- 8-43	C. C. 24	T-377	W	M	3	17.0	U.R.T.	2nd	O 6.6 SD SC 17.5 SD IV 2.0 SD	12	O 11.25 SD SC 13.75 SD IV 2.0 SD	12.2-59.6	8.4-4.2	IM	100,000 U	2nd
1st entry 6-10-43	G. W. 25	T-458	W	M	8/12	6.5	U.R.T.	3rd	O 28.2 SD SC 19.2 SD SC 0.75 SPZ	25	SC 5.8 SD	2.1-29.0	2.3-23.0	—	—	—
2nd entry 8- 5-43		T-458	W	M	10/12	6.0	?	Recurrence 2nd	O 16.0 SPZ SC 48.6 SPZ	24	O 16.0 SPZ SC 23.6 SPZ	4.2-26.0	0.8-15.3	IT IT	25,000 25,000	18th 20th
4-13-43	M. H. 26	T-899	C	F	3/12	3.6	Blood stream	1st	SC 0.9 SPZ	17-24	Never negative	—	—	—	—	—

U.R.T., Upper respiratory tract. T.B., Temporal bone. O, Orally. R, Rectally. IM, Intramuscularly. IS, Intraspinously. IV, Intravenously. IC, Intracisternally. IT, Intrathecally. IVent, Intraventricularly. SC, Subcutaneously. S, Sulfanilamide. Sp, Sulfapyridine. SMT,

cultured from it. It should be specially noted that at the beginning of the relapse, organisms grew from spinal fluid which contained only 48 cells per cubic millimeter.

Quite promptly following reinstitution of intrathecal and subcutaneous administration of sulfanilamide, which increased the total dosage to 6 Gm. daily for the next six days, the spinal fluid again became sterile and cleared, and all meningeal symptoms again disappeared. Oral administration of the drug was continued, however, and on May 27, a semiradical mastoidectomy (without removal of the ossicles) was performed. Cells filled with granulation tissue, which extended through a dehiscence between the membranous portion of the canal wall and the bony plate of the lateral sinus to the dura of the middle fossa, were found. Uninterrupted convalescence followed, and chemotherapy was discontinued on June 14, after fifty days of administration.

The patient was re-examined on October 17, 1942, when she was 14 years, 10 months of age, some five years after recovery from the meningitis. No neurological residua could

TABLE II—Continued

Other Therapy			Bacteriological Data													
	Mastoidectomy		Blood Culture				Spinal Fluid									
							Smear			Culture						
Spinal Drainage Days	Side	Day of Treatment with Sulfonamide	No. Taken	No. Pos.	No. Neg.	Day of Treatment When Last Positive	1st	Type	Day of Treatment When Last Positive	1st	Type	Day of Treatment When Last Positive	Complicating Infections	Days of Hospital Stay	Outcome
—	—	—	1	0	1	—	+ Few	Not until culture	Never permanently negative	+	XVIII	Never permanently negative	Right lower lobe pneumonia, bilateral otitis media	35	D
C (18) L (14)	—	—	10	2	8	26th	+ Few	Not until culture	30th	+	VI	31st	Chronic sinusitis, *Staph. aureus* in laminectomy	66	R
—	—	—	0	0	0	—	—	—	—	+	XIX	Organism found at post-mortem	Penumonia left lower lobe, empyema left, brain abscess (staph. + pneumococcus)	1/24	D
—	—	—	1	1	0	Never negative	+	Not until culture	Never negative	+	V	Never negative	Bacteremia	12/24	D
—	—	—	1	1	0	Never negative	+	VI	Never negative	+	VI	Never negative	Bilateral chronic otitis media, bronchopneumonia, septicemia	2	D
—	—	—	1	1	0	Never negative	+	Not until culture	Never negative	+	XVIII	Never negative	Bronchopneumonia, bacteremia, pertussis	2	D
—	Right & left antrotomy	—	5	1	4	1st	+	XII	2nd	+	XII	13th	Bilateral otitis media, deficient tegmina mastoideotympani	47	R
—	—	—	1	0	1	—	+	IV	2nd	+	IV	1st	? Mastoiditis, right	34	R
—	—	—	1	0	1	—	0	Not until culture	—	+	III	2nd	Bilateral otitis media	11	R
—	—	—	2	2	0	Never negative	0	Not until culture	—	+	XIV	Never negative	Pertussis, bacteremia, bronchopneumonia	2	D
—	—	—	0	0	0	—	+	XIV	2nd	+	XIV	2nd	None	13	R
—	—	—	2	0	2	—	+	XXIII	4th	+	XXIII	3rd	Bilateral otitis media	47	See below
—	—	—	0	0	0	—	+	2nd culture	2nd	0	XXIII	24th	None	55	R
—	—	—	1	0	1	—	—	—	—	+	XIV	Found at post-mortem	Bronchopneumonia pleural effusion	17/24	D

Sulfamethylthiazole. SPZ, Sulfapyrazine. SD, Sulfadiazine. ST, Sulfathiazole. P, Prontosil. Na, Sodium salt. L, Laminectomy. LP, Lumbar puncture. C, Catheter. N, Needle method. R, Recovered. D, Died.

be found, and the interval history indicated that she had been in good health and apparently quite normal except for more or less continued drainage from the left ear where a fungus infection of the still partially stenosed canal wall was noted. Mental appraisal by one of us (B. S. K.) was as follows: The I.Q. of 84 (Stanford-Binet—Form L) is consistent with at least normal intelligence. There is fairly wide "scatter" with poor work in vocabulary and rote memory (which may be related to a definite difficulty in reading which mother reported was present before patient's illness) and good work in associative thinking. There is no evidence of disturbance in visual-motor integration.

She was again seen when 16 years old on August 5, 1944, specially for a Rorschach test. She had been in good health except for intermittent drainage from her left ear. The Rorschach report was: The record is that of a normal girl. She is conforming, slightly introverted, not too ambitious. She is aware of everyday problems. There is some indication of immaturity, but at her age this is not a serious handicap. She shows poten-

tialities for making a better social adjustment than she has hitherto achieved. There is no suggestion in the record of intracranial damage.

CASE 4 (Table II).—Three months previous to hospital entry this 4-year-old boy, H. L., had a left lobar pneumonia complicated by a left empyema which was treated by intercostal drainage. He had also had bilateral suppurative chronic otitis media for two years, persisting until a week before entry. Six weeks before his first hospital entry on May 5, 1937, he had complained of almost constant frontal headache. Vomiting occurred sometimes three or four times a day.

On examination on May 5, he seemed not to be acutely ill, and the only positive physical findings included bilateral chronic otitis media and bilateral moderate papilledema. There were no localizing signs on neurological examination. There was mucopurulent postnasal discharge with moderate tenderness over the maxillary sinuses and questionable tenderness over the left mastoid. There was x-ray evidence of bilateral mastoiditis, bilateral maxillary sinusitis, and increased intracranial pressure. Lumbar puncture at this time revealed a normal spinal fluid. The child was removed from the hospital at this time without complete study and against advice.

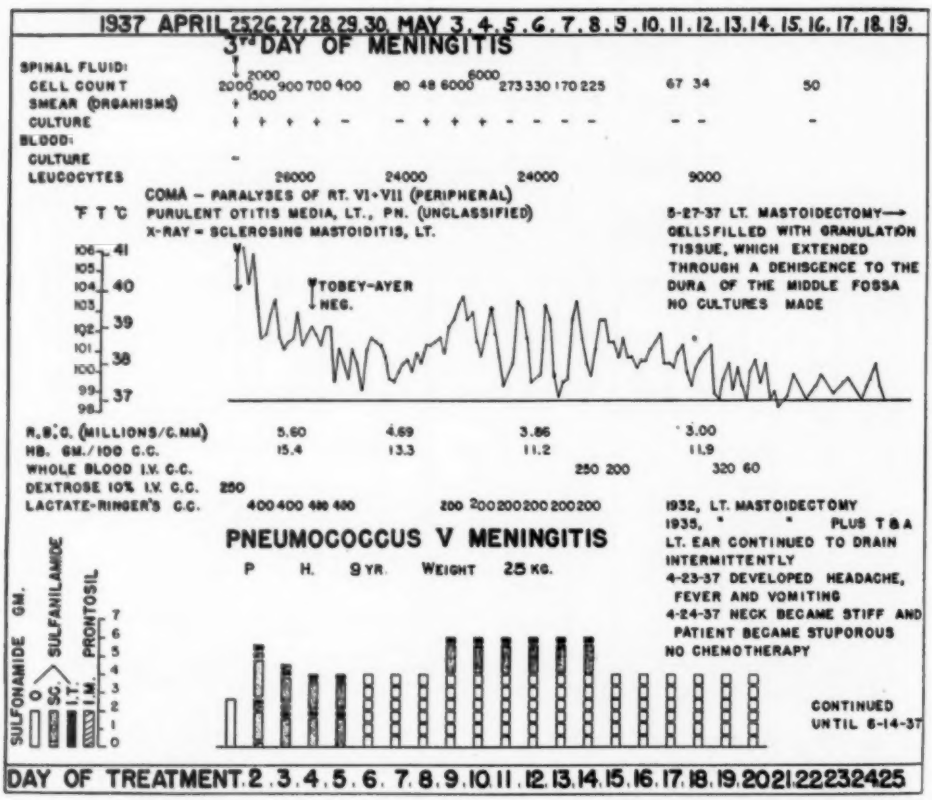


Chart 3.

Ten days later, on May 19, he re-entered the hospital because of continued vomiting and headaches, and a history was given of loss of vision of one day's duration and drowsiness throughout the morning of the day of entry. Physical examination now revealed a stuporous child, acutely ill, and definitely blind. There was bilateral severe papilledema; the temperature was 38.3° C., and there were convulsions limited to the right side. Ventriculogram done on May 20 revealed marked displacement of the left lateral ventricle (Figs. 1 and 2) indicative of brain abscess. Aspiration of the left frontal lobe obtained 30 c.c. of thick green pus. Following these procedures, the patient was a little better,

but then rapidly became worse with increasing drowsiness and the development of a right hemiparesis. On May 26, the abscess of the left frontal lobe was drained by operation. Definite signs of meningitis then developed, and a lumbar puncture done on May 28 obtained cloudy spinal fluid. Both from the abscess pus and from the spinal fluid pneumococcus type III was grown. The spinal fluid continued to show pneumococcus type III throughout the rest of the hospital course, but blood cultures showed no growth.

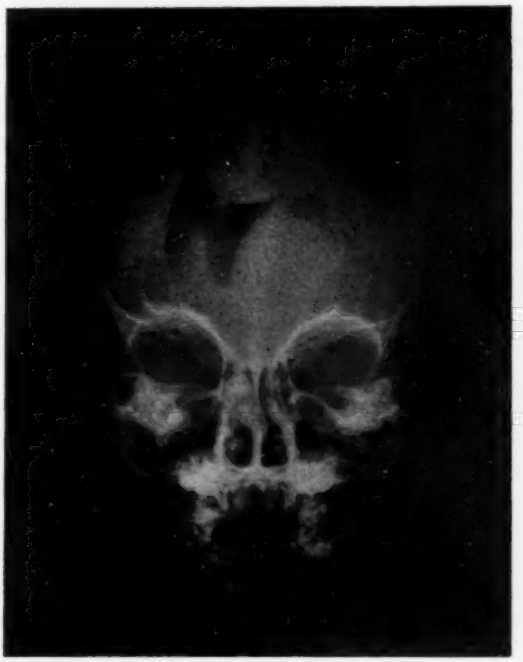


Fig. 1 (Case 4).—Ventriculogram, P-A view, showing dilatation of both anterior horns and displacement to the right.

Fig. 2 (Case 4).—Ventriculogram, left stereolateral, showing posterior and inferior displacement of left lateral ventricle with moderate dilatation.

Chemotherapy was begun on May 21 with sulfanilamide given orally and was continued by sulfanilamide administered orally, subcutaneously, and intrathecally. Drainage of the spinal fluid was attempted by repeated lumbar punctures, and a small catheter drained the abscess. Rabbit antipneumococcus serum type III was given intrathecally on the eighteenth and nineteenth days of the meningitis. No treatment was of any avail, and he expired on June 7.

The brain at autopsy, performed by Dr. R. Kelley of the Department of Pathology, showed exudate over the vertex and heavy exudate at the base of the brain and along the spinal cord. Cortical convolutions were flat and sulci narrow. In the left frontal lobe was a large brain abscess.

Post-mortem examination of the temporal bones (D. Wolff) revealed intense infection throughout. On the left, infection had invaded through the oval window causing a labyrinthitis, and there was a route of extension into the subarachnoid space through the cochlear aqueduct. The internal auditory meatus was densely filled with pus. A similar labyrinthitis was present on the right. These findings are especially noteworthy since they indicate that the fatal meningitis was by way of labyrinthine extension rather than as a result of the brain abscess.

CASE 5 (Table II).—This 26-month-old infant, A. R., first became ill three weeks before hospital entry with an upper respiratory infection; cough, sore throat, and rhinitis which lasted one week. After some initial improvement, there occurred a progressive enlargement of the cervical glands. For two days prior to entry, there were again fever, cough, restlessness, and irritability.

On entry, December 8, 1937, she was found to be moderately ill with a temperature of 40.9° C., an upper respiratory infection, and acute otitis media on the right. There was a large soft mass in the right side of the neck. The lungs seemed clear at this time, and there were no meningeal signs.

The otitis media and cervical adenitis subsided on chemotherapy with sulfanilamide, but she continued to have a septic type of fever. By the third hospital day it became evident that she had pneumonia. This process rapidly extended to involve the entire left lung, and she became very acutely ill. Sulfanilamide was continued by oral dosage, and 40 c.c. of rabbit antipneumococcus serum polyvalent were given intramuscularly. On the tenth hospital day, there were signs of a left empyema. On December 27, closed drainage of the empyema cavity was instituted, but the patient continued to do poorly and to have considerable irregular fever. Repeated aspirations of the chest failed to reveal any undrained empyema pockets. On February 19, 1938, she suddenly began vomiting and developed generalized convulsions. A lumbar puncture done at this time revealed cloudy spinal fluid with 2,300 cells and numerous gram-positive diplococci seen on stained smear. These were later typed as pneumococcus type VII. Blood culture grew out this same organism. Large doses of sulfanilamide were then given intraspinously, intravenously, and subcutaneously. Supportive therapeutic measures included several blood transfusions and a continuous intravenous infusion of dextrose and lactate-Ringer's solution to which sulfanilamide was added.

The therapeutic measures instituted brought about no improvement. The cell count of the spinal fluid rose steadily, and a profuse growth of pneumococcus was obtained on all occasions. She expired on February 24.

At autopsy, performed by Dr. Margaret Smith of the Department of Pathology, there were found a healed empyema with thickened pleura on the left, an acute fibrinous pericarditis, and exudate over the convexity of the brain and at the base. Dr. Dorothy Wolff made the following microscopic observations of temporal bone sections: This tissue stains poorly for cellular detail, probably because of the delayed autopsy. The case presents a bilateral purulent labyrinthitis. On the right there is a relatively mild otitis media. Antrum is clear. A few clusters of cells appear in the parantral pneumatic spaces. Occasional masses of inflammatory cells occur in the middle ear and eustachian tube. In the tube there are fimbriated extensions of the mucosa showing generalized infiltration of round cells. Drum membrane is intact but thickened anteriorly. Mucosal lining is sloughed off of the medial surface in areas. There is little tissue reaction in the mucosa throughout middle ear and mastoid. There is no osteitis. No route of extension into inner ear is seen. From the sections as they now appear, it seems as if the labyrinthitis must have come from the meningitis rather than from the otitis media. Left middle ear is essentially normal, but, as stated above, there is a purulent labyrinthitis. The infection here un-

doubtedly followed along the cochlear nerve into the inner ear. There is hyperactivity of the marrow in both petrosae with dissolution of fat cells. Cell contours are angular, and the cells appear shrunken.

CASE 6 (Table II).—This 5-year-old boy, N. T., had had left otalgia and fever in September, 1937, which recurred in the middle of October, at which time the left ear drained spontaneously for about one week. A similar episode occurred again in November some three weeks later, with a discharge from the left ear lasting several days. On December 15, there was recurrence of earache, and two days later he began to complain of occipital headaches and pain on flexing his neck. The headache abated somewhat, but three days previous to entry became suddenly quite severe, and he began to vomit; he then became drowsy and appeared much worse.

Physical examination on entry revealed him to be semistuporous and irrational with a temperature of 39.5° C. with definite meningeal signs. The left drum membrane was retracted, dull, and thickened. The right drum membrane showed similar but less marked changes. There was no definite mastoid tenderness, but there was x-ray evidence of mastoiditis on the left. A lumbar puncture revealed cloudy spinal fluid with 1,350 cells. No organisms were seen on stained smear, but later pneumococcus type III was cultured. Intravenous and subcutaneous fluids and sulfanilamide intraspinally were given, following which a left simple mastoidectomy was performed on the night of entry, revealing much necrotic bone and thin yellow pus. Culture from the mastoid grew out a pneumococcus which was not classified. The lateral sinus was gray and thickened, but no gross portal of entry for meningitis was revealed. Sulfanilamide was continued orally, intrathecally, and subcutaneously, and prontosil was given intramuscularly. Following operation, bilateral papilledema developed. On January 7, 1938, rabbit antipneumococcus serum type III was given, 80 c.c. in all, partly intramuscularly and partly intraspinally. The following day an additional 40 c.c. were given partly intramuscularly and intraspinally, and on the next day another 25 c.c. were given into the cistern. Neither sulfonamide chemotherapy nor serum therapy had any effect on the course of the disease, and the patient expired on January 13.

At autopsy, performed by Dr. L. M. Shefts of the Department of Pathology, there was found an organized and infected clot in the left lateral sinus. The leptomeninges throughout presented scattered areas of pus, and there was a large amount of pus around the base of the brain. The following is Dr. Dorothy Wolff's observation on the temporal bones. Left ear—this specimen shows a chronic mastoiditis, otitis media, and petrositis. Parantral cells and retrolabyrinthine cells are filled with empyemic membrane. A direct route of extension from the mastoid can be traced through the still patent subarcuate fossa to a retrolabyrinthine chain of cells, and these lead forward to the petrous apex. Sections 330-410 show a pathological dehiscence from retrolabyrinthine cells and a subdural abscess. The chronicity of the apicitis and mastoiditis is evidenced by the presence of small recently developed trabeculae of bone in this region. Middle ear cavity contains granulation tissue and a bloody exudate. Pus cells can no longer be identified. The inferior part of the tympanum is almost free of infection. Numerous peritubal cells diverticulate from the bony tube and show active infection. Drum membrane is markedly thinned. Inner ear shows suppurative labyrinthitis. Liquefaction and degeneration of organ of Corti and spiral ganglion cells have occurred. The route of extension to the inner ear cannot be traced. Marrow cells appear necrotic. Right ear—the right ear is within normal limits in middle ear and mastoid. Inner ear shows a bloody exudate, but pus cells cannot be identified. Ductus endolymphaticus is packed with necrotic pus cells (section 460). End organs are completely degenerated.

CASE 7 (Charts 4, 5, and 6 and Table II).—This 10-year-old boy, D. G., had had nasal obstruction present since the age of 2 months, and since the age of 12 months a chronic purulent drainage from the right side of the nose. At the age of 3 years "eight" polyps were operatively removed. There was gradual recurrence of the nasal obstruction with a continuous watery drainage. For several years there were frequent frontal headaches and periods of unconsciousness lasting fifteen to twenty minutes following even light blows to the nose. There were also frequent attacks of upper respiratory infection associated with febrile convulsions.

The boy was admitted to the hospital on February 28, 1938, and the following day two polyps were removed from the right ethmoid labyrinth. The operative note states that upon removal of the polyps there was also seen what looked like pale edematous

membrane sagging anteriorly from the roof. This was not unlike polypoid tissue, but due to the close proximity to the cribriform plate it was left undisturbed. There was also evidence of right maxillary sinusitis. On the day following operation, the child's temperature rose, and signs of meningeal irritation appeared. The spinal fluid was turbid with a cell count of 4,520, but no organisms were seen on smear nor were any cultured on this first examination. X-ray examination revealed erosion of the nasal septum and roof, cribriform plate, dorsum sellae, and medial wall of the right maxillary sinus.

On March 2, chemotherapy was begun with sulfanilamide subcutaneously. On the same day a lumbar laminectomy for spinal drainage was instituted by the neurosurgical service. Sulfanilamide administration was discontinued for a few hours on March 4 and 5, but chemotherapy was then reinstituted and continued until April 27, on which date and on April 26 none was given. Sulfanilamide was employed subcutaneously and orally, and prontosil was given intramuscularly later in the course of his disease. The spinal drainage by laminectomy continued until March 29, at which time it ceased, and the drain was removed. Throughout this period of treatment, the spinal fluid cultures persistently were

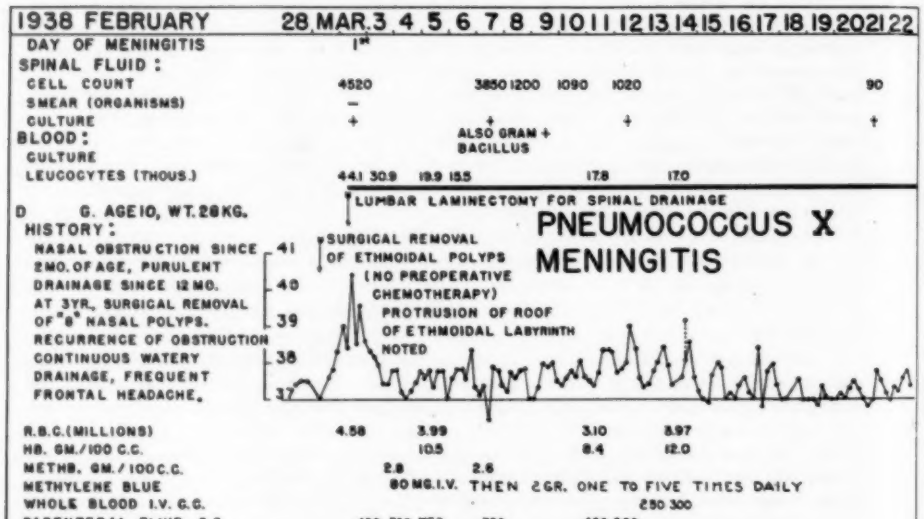


Chart 4.

positive for pneumococci although the cell count fell steadily to a level of 15 cells on March 27. Methemoglobinemia with cyanosis developed rapidly on sulfanilamide treatment, and rather large amounts of methylene blue were given intravenously at first and later orally with good control. From March 29 to April 5, there was some headache and stiff neck following discontinuation of lumbar laminectomy drainage, partially relieved by repeated lumbar punctures.

On April 4, bilateral suppurative otitis media developed, and bilateral myringotomy obtained frank pus from which hemolytic streptococci were cultured. A low grade temperature present during the preceding period rose to higher levels but fell promptly to normal after the myringotomy was performed. Following this episode, there was a period

in which no meningeal signs or symptoms were present despite continued positive spinal fluid cultures. Drug dosage had been reduced on April 12 to 4 Gm. daily because it was believed that the patient had been cured. Because of the positive spinal fluid cultures, however, spinal drainage by catheter was instituted on April 17 and continued until April 19, at which time the catheter was removed. On this same date, he began again to complain of headache, vomited, and began to have high fever. Cell count on the spinal fluid, which had been down to 4 and 5 cells, rose rapidly in the ensuing few days, and at the same time the patient developed a high spiking type of temperature curve. During this period, there were many positive spinal fluid cultures for pneumococcus type X.

As his condition became worse, clinically, fluid intake by mouth was reduced and had to be supplemented by considerable amounts of parenteral fluids. After removal of the spinal catheter, it was decided to try intrathecal administration of sulfanilamide as 1 per cent solution. Therefore, on April 21, 30 c.c. were instilled into the cistern. This procedure was followed by slight clinical improvement, and in view of this it was decided to attempt instillation of sulfanilamide into the ventricles. Perforator openings were then

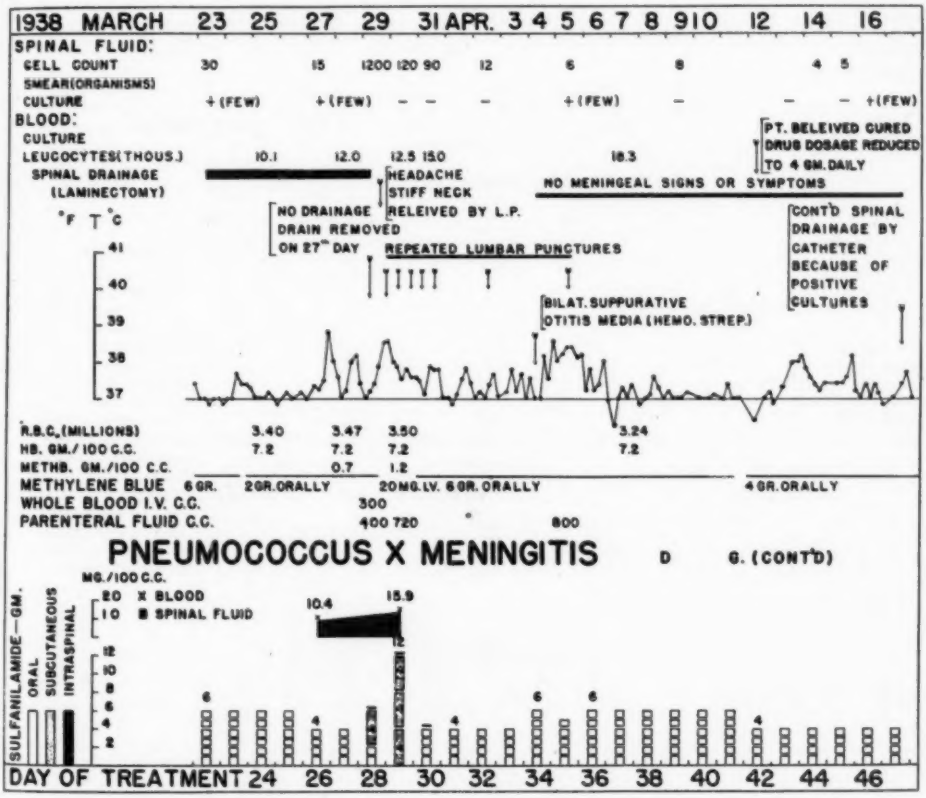

1938 MARCH 23 25 27 29 31 APR. 3 4 5 6 7 8 9 10 12 14 16
SPINAL FLUID:
CELL COUNT 30 15 1200 120 90 12 6 8 4 5
SMEAR (ORGANISMS)
CULTURE + (FEW) + (FEW) - - - + (FEW) - - - + (FEW)
BLOOD:
CULTURE
LEUCOCYTES (THOUS.) 10.1 12.0 12.5 15.0 18.3
SPINAL DRAINAGE (LAMINECTOMY)
PT. BELEIVED CURED DRUG DOSAGE REDUCED TO 4 GM. DAILY
HEADACHE STIFF NECK RELEIVED BY L.P.
NO MENINGEAL SIGNS OR SYMPTOMS
NO DRAINAGE DRAIN REMOVED ON 27TH DAY
REPEATED LUMBAR PUNCTURES
CONT'D SPINAL DRAINAGE BY CATHETER BECAUSE OF POSITIVE CULTURES
BILAT. SUPPURATIVE OTITIS MEDIA (HEMO. STREP.)
°F °C
41
40
39
38
37
R.B.C. (MILLIONS) 3.40 3.47 3.50 3.24
HB. GM./100 C.C. 7.2 7.2 7.2 7.2
METHB. GM./100 C.C. 0.7 1.2
METHYLENE BLUE 6 GR. 2 GR. ORALLY 20 MG. I.V. 6 GR. ORALLY 4 GR. ORALLY
WHOLE BLOOD I.V. C.C. 300
PARENTERAL FLUID C.C. 400 720 800
PNEUMOCOCCUS X MENINGITIS
MG./100 C.C.
20 X BLOOD
10 B SPINAL FLUID
10.4 15.9
SULFANILAMIDE—GM.
ORAL
SUBCUTANEOUS
INTRASPINAL
12
10
8
6
4
2
DAY OF TREATMENT 24 26 28 30 32 34 36 38 40 42 44 46

Chart 5.

made on April 22, and 8 c.c. of 1 per cent sulfanilamide were instilled into the right ventricle. On three more occasions, sulfanilamide was also instilled into the ventricle without appreciable effect on the clinical course of the disease. During this period, sulfanilamide was given subcutaneously, and prontosil was administered in addition intramuscularly. Drainage from the old lumbar laminectomy wound was negligible at this time, and on April 26 a secondary thoracico-lumbar laminectomy was performed. He almost immediately became a great deal worse and developed high fever. Of repeated blood cultures during this period, one was positive. At this time it was decided to try administration of anti-pneumococcus serum, and a total of 25 c.c. was given in three injections. There was no clinical improvement, and the patient expired suddenly on May 7.

At autopsy there was found a localized abscess of the right frontal lobe close to the cribriform plate with an anatomical abnormality of the ethmoid bone in the region of the cribriform plate and a sinus tract leading into the right lateral ventricle. The general pathological condition was reported by Dr. A. C. Graves of the Department of Pathology as follows:

"The cerebral cortex is clean and smooth and, on removal of the tentorium cerebelli and removal of the brain by cutting the spinal cord at the foramen magnum, there is seen to be an accumulation of purulent material at the base of the brain around the pons and the cerebellar pontine angle. There is also at the tip of the right frontal lobe a softening of the brain tissue which communicates with the ventricular system and lies between the right lateral horn and a small abscess lying close against the cribriform plate. The

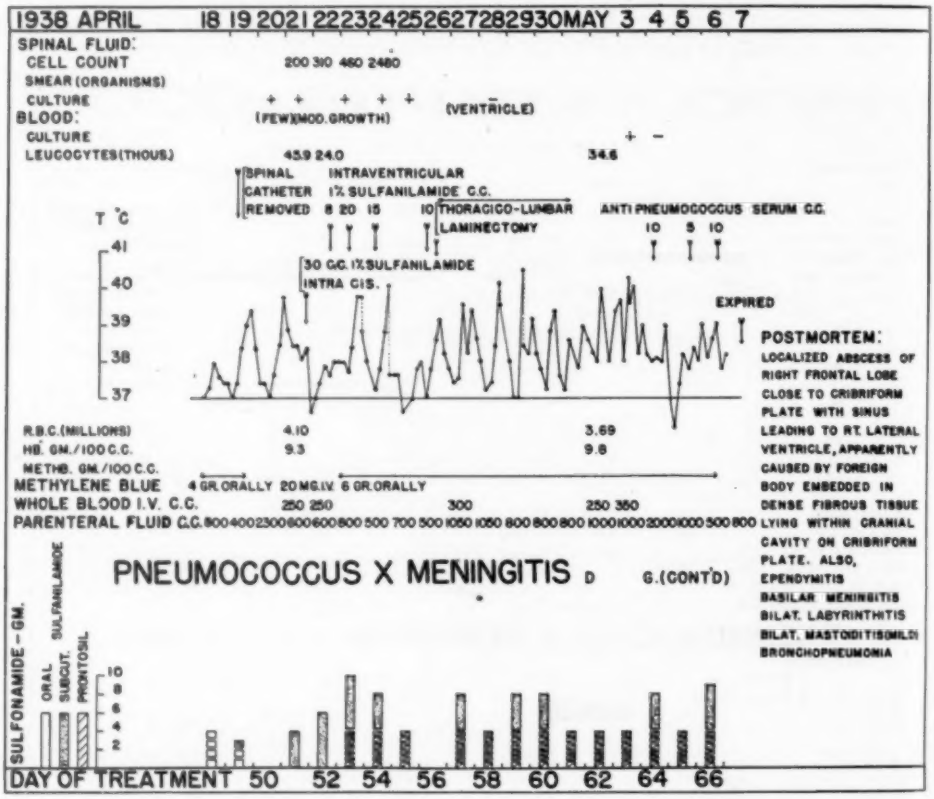


Chart 6.

crista galli is deviated toward the left of the cribriform plate, and there is a distinct depression in the anterior portion of the bone. There is purulent material in this area whereas the rest of the cerebral cortex is perfectly clean. The sinus tract is seen to lead back from this area of depression in the cribriform plate on the right side to the ventricle on that side. There is purulent material within the ventricle."

A report of the post-mortem examination of the temporal bone and cribriform plate by D. Wolff follows:

"Both mastoids show mild infection, but bilateral labyrinthitis is also present, more severe on the left. In the midst of dense fibrous tissue within the cranial cavity on the cribriform plate was a small blue staining fibrous body which apparently had been present for a long time, possibly from the first surgical procedure six years previously. Its staining properties indicated that it was not cotton, but its exact identity was not established."

CASE 8 (Chart 7 and Table II).—This 5-month-old boy, R. M., had been followed closely in the Out-Patient Department since the age of 6 weeks and was developing quite normally until he became acutely ill with an upper respiratory infection on December 21, 1938. On December 25, he developed a high fever, and on the next day convulsions occurred, confined at first largely to the left side but later becoming generalized. Such seizures lasted for about an hour, and after they had ceased the boy was brought to the hospital.

Signs of an acute generalized upper respiratory infection were present. The left eardrum was red, still with good landmarks. The right drum was both full and red. Typical meningeal signs were not present, and the impression at this time was that the boy had had a febrile convulsion associated with acute otitis media. Sulfonamide chemotherapy was started immediately as sulfanilamide given orally in a dosage of 0.2 Gm. per kilogram of body weight. The following day, however, as the child seemed worse, meningitis was suspected, and a lumbar puncture was made. The spinal fluid was cloudy due chiefly to the large number of organisms which were noted to be gram-positive diplococci; later on

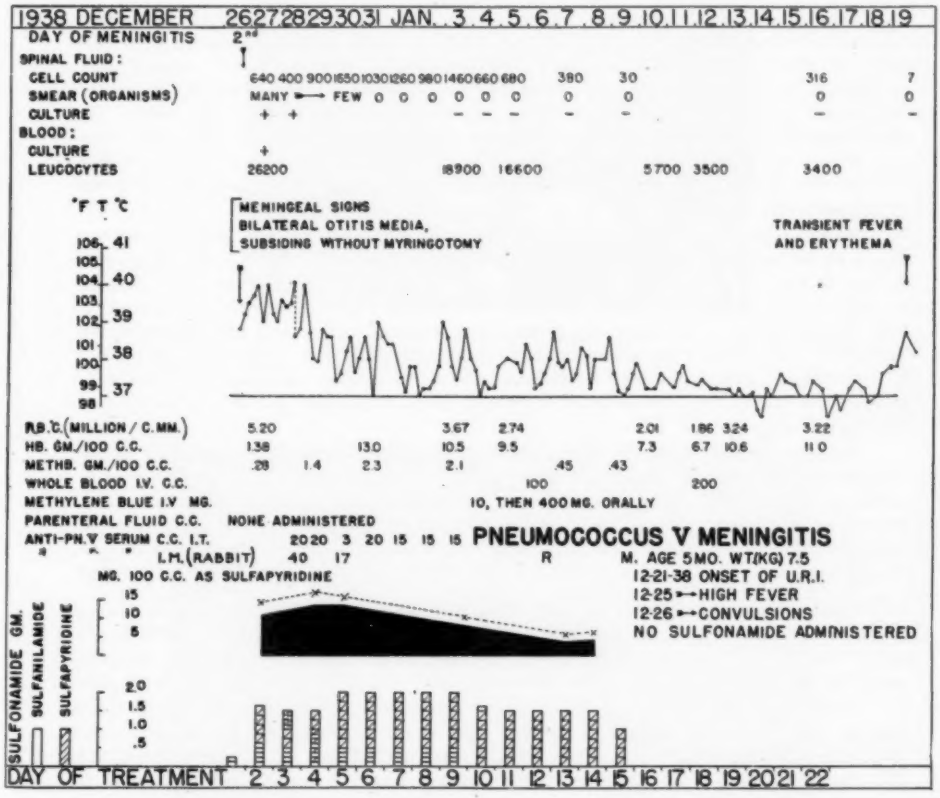

1938 DECEMBER 26 27 28 29 30 31 JAN. 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
DAY OF MENINGITIS 2nd
SPINAL FLUID:
CELL COUNT 640 400 900 1650 1030 1260 980 1460 660 680 380 30 316 7
SMEAR (ORGANISMS) MANY → FEW 0 0 0 0 0 0 0 0 0 0 0
CULTURE + + − − − − − −
BLOOD:
CULTURE +
LEUCOCYTES 26200 18900 16600 5700 3500 3400
°F °C
MENINGEAL SIGNS
BILATERAL OTITIS MEDIA, SUBSIDING WITHOUT MYRINGOTOMY
TRANSIENT FEVER AND ERYTHEMA
106 41
105
104 40
103
102 39
101
100 38
99 37
98
R.B.C. (MILLION / C.MM.) 5.20 3.67 2.74 2.01 1.86 3.24 3.22
HB. GM./100 C.C. 1.38 1.30 10.5 9.5 7.3 6.7 10.6 11.0
METHB. GM./100 C.C. .28 1.4 2.3 2.1 .45 .43
WHOLE BLOOD I.V. C.C. 100 200
METHYLENE BLUE I.V. MG. 10, THEN 400 MG. ORALLY
PARENTERAL FLUID C.C. NONE ADMINISTERED
ANTI-PN.V SERUM C.C. I.T. 20 20 3 20 15 15 15
I.M. (RABBIT) 40 17 R
PNEUMOCOCCUS V MENINGITIS
M. AGE 5 MO. WT.(KG) 7.5
12-21-38 ONSET OF U.R.I.
12-25 → HIGH FEVER
12-26 → CONVULSIONS
NO SULFONAMIDE ADMINISTERED
MG. 100 C.C. AS SULFAPYRIDINE
SULFONAMIDE GM.
SULFANILAMIDE
SULFAPYRIDINE
15
10
5
2.0
1.5
1.0
.5
DAY OF TREATMENT 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

Chart 7.

culture and typing they proved to be type V. A blood culture made at this time also grew out the same organism. As soon as the nature of the meningitis was indicated from the stained smear of the spinal fluid, sulfapyridine was administered in addition to sulfanilamide. Gradual improvement followed the institution of such chemotherapy. The organisms in the spinal fluid gradually diminished in number, not disappearing, however, until the fifth day of treatment. The spinal fluid cell count, low to begin with (640), rose to 1,250 and then diminished slowly. Fever gradually abated. Convulsive twitchings, however, persisted during the first three days of treatment, and during this time the general condition of the child remained critical.

On December 28, the second day of sulfapyridine therapy, probably the fourth day of meningitis, rabbit antipneumococcus serum was administered both intraspinously (20 c.c.) and intramuscularly (40 c.c.). Intraspinous administration was continued daily for altogether seven days. By this time considerable cyanosis due to accumulation of methemoglobin had developed, and methylene blue was given intravenously to effect a rapid control and then administered orally throughout the remainder of the period of sulfapyridine administration in order to prevent reaccumulation of significant amounts of methemoglobin. Sulfapyridine administration was continued altogether for fourteen days at which time the spinal fluid was almost normal, and very little fever remained. The otitis media had subsided during this period without myringotomy. Considerable anemia and definite leucopenia developed during the latter part of the sulfapyridine administration. Transfusions rapidly corrected the anemia, but the leucopenia persisted for some ten days longer. On January 19, nine days after discontinuation of drug administration, a return of fever was noticed which lasted five days and was associated with a rash, at first maculopapular in type and later looking somewhat urticarial. Some stiffness of the neck again developed without the reappearance of any other meningeal signs. Spinal fluid remained sterile.

After discharge from the hospital on January 25, 1939, the boy devèloped irritability and vomited considerably, and phenobarbital had to be prescribed as a sedative. On February 13, there appeared another acute upper respiratory infection with running nose, lacrimation, fever, and hoarseness. When the boy was admitted to the hospital on the following day, nothing more than a simple upper respiratory infection was found. The spinal fluid was quite normal, containing but 3 lymphocytes and was sterile. The leucocyte count was 13,200 with a slight shift to the left, the red blood cell count 4,440,000, and the hemoglobin 12.4 Gm. Fever subsided in twenty-four hours, and the child was discharged a few days later.

He was readmitted on May 6, 1940. The interval history revealed that he had continued to be irritable and continued to have convulsive seizures. He did not sit up until he was 16 months of age and did not walk until he was 18 months of age. He dragged his left foot for from four to six weeks after he began walking. He had not learned to talk, recognized only his father and mother, and would not play with any degree of concentration. He was still incontinent of urine and feces. A pneumo-encephalogram on May 7, 1940 (Figs. 3 and 4), showed some dilatation of the lateral ventricles, the right being larger than the left. Considerable vomiting and drowsiness followed the pneumo-encephalogram.

The patient was re-examined on June 14, 1944, at which time he was 6 years of age. Convulsive seizures had ceased following the air studies in 1940, but developmental retardation was severe. He was able to say a few words but not able to dress or feed himself or control passage of urine and feces. Physical findings were not remarkable except for obvious retardation of development and a rather shambling incoordinated gait. Mental appraisal (B. S. K.) was as follows: I.Q. of 25 is consistent with intellectual defect.

Case 9 (Chart 1 and Table II).—This 8-month-old Negro boy, M. G., had been ill since January 1, 1939, with an acute upper respiratory infection. On January 8, he began to have very high fever, rapid respirations, and increasing drowsiness. Shortly preceding entry, he had a generalized convulsion followed by stupor. No chemotherapy had been given.

Physical examination on entry revealed an acutely ill, stuporous infant with a firm bulging anterior fontanelle and a slightly stiff neck. There were signs of mild upper respiratory infection but no involvement of either ear. There were rhonchi throughout the chest but no evidence of consolidation. Lumbar puncture done at 1 A.M., January 10, obtained a clear fluid with only 7 lymphocytes. This fluid unfortunately was not cultured. Convulsions and stupor continued, and at 3 P.M. another lumbar puncture was performed which obtained slightly cloudy fluid with a cell count of 85 cells—mostly polymorphonuclear leucocytes. In this specimen pneumococci were seen on stained smear and typed directly as type XIV. There was also a white blood cell count of 13,800 with a marked left shift. Positive Wassermann and Kahn tests on the blood were present, and blood culture showed growth of type XIV pneumococcus.

Chemotherapy was begun with the administration of sulfapyridine orally, and a spinal fluid concentration of sulfapyridine obtained just before death was 5.3 mg. per cent. In addition, rabbit type XIV antipneumococcus serum was given intramuscularly and intraspinously. In spite of these measures and supportive therapy including a continuous intravenous infusion with dextrose, he failed rapidly and died after thirty-six hours.

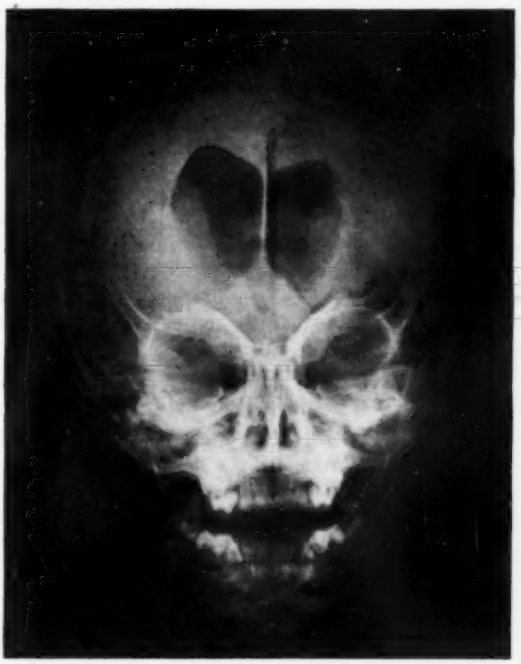


Fig. 3 (Case 8).—Encephalogram, P-A view, showing dilatation of anterior horns of both lateral ventricles (Evans[9] index .406), right somewhat more than left; also showing marked dilatation of third ventricle.

Fig. 4 (Case 8).—Encephalogram, right stereolateral, moderate dilatation of both the lateral ventricles and the third ventricle.

At autopsy, performed by Dr. Petkevich of the Department of Pathology, there was found a thick, gelatinous, greenish exudate covering all cortical surfaces; also early bronchopneumonia was noted. The temporal bones were not removed for study.

CASE 10 (Table II).—This 7-month-old boy, C. A., born prematurely with congenital syphilis and receiving treatment, had been admitted to the hospital in December, 1938, because of a slightly enlarged head, the cause of which was not obvious. He was found still to have a positive blood but negative spinal fluid Wassermann. Re-entry on February 28, 1939, was preceded by irritability and restlessness for two days with a watery nasal discharge, high fever, drowsiness, and prostration for one day. On admission he was acutely ill with definite signs of meningitis and a marked hydrocephalus. The spinal fluid was turbid due to organisms with a cell count of only 152, mostly lymphocytes. Culture revealed these organisms to be pneumococcus type XVIII. A blood culture taken on entry also showed growth. Treatment was begun with sulfapyridine, but he grew rapidly worse and expired on March 1, 1939, less than twenty-four hours after admission. Shortly before death a ventricular puncture was attempted, and a large amount of fluid was encountered rather superficially, apparently from a subdural cyst. This fluid also contained a large number of organisms. Autopsy permission was not obtained.

CASE 11 (Table II).—This child, R. U., was only 6 days old on entry. She began to vomit dark blood several hours after birth on May 18, 1939, several such episodes occurring on this day. On May 22, she refused to nurse, became listless and pale, and had fever. Cyanotic attacks were noted for the first time, and the anterior fontanelle was noted to be a little tense. The fever persisted, and on the day of entry on May 24, cyanotic spells recurred. No chemotherapy had been given.

Physical examination on the day of admission revealed the child to be quite listless with a temperature of 38.7° C., but easily aroused and with a good cry. Cyanosis and slight convulsive twitching occurred during the course of the examination, and the patient was noted to have one period of apnea. The fontanelle was tense and bulging, and both eardrums were red and bulging. The spinal fluid was cloudy with a cell count of 610. Numerous gram-positive diplococci were present on stained smear, which were later shown to be pneumococcus type I. On bilateral myringotomy, from both eardrums pus was obtained which on culture grew out pneumococci in almost pure culture.

Treatment was begun with sodium sulfapyridine intravenously and sulfapyridine orally. Twenty thousand units of rabbit antipneumococcus serum type I were given intramuscularly on May 25, and repeated on the following day. Repeated cisternal and lumbar punctures were performed for drainage. Spinal fluid cultures always showed good growth of pneumococci. The child seemed overwhelmed by the infection, developed a subnormal temperature, and expired on May 29. Blood sulfapyridine concentrations were apparently never adequate, the highest level being but 3.6 mg. per 100 c.c.

CASE 12 (Table II).—One year previously, this 10-year-old boy, W. B., had had an upper respiratory infection with otalgia followed by drainage from the right ear which lasted for a few days. During the intervening period, there were no symptoms; but two months before hospital admission, the mother had noticed that the child was becoming progressively harder of hearing. On October 31, 1939, he developed an upper respiratory infection with severe earache. Temperature at this time ranged as high as 104° F. Five days before admission, he began to complain of a stiff neck and two days before entry became totally deaf and delirious. He also began to have considerable vomiting. Right myringotomy was performed on November 5, and during the evening the right ear began to drain copious amounts of thick greenish pus. During all this illness, no chemotherapy was given.

On entry on November 6, the patient was very acutely ill with a temperature of 41.3° C. He was totally deaf and uncooperative but seemed to be generally hypersensitive and at times delirious. Breathing was typically Biot in nature. The neck was quite rigid and painful on flexion, and Kernig's sign was markedly positive bilaterally. The left eardrum was dull and gray and full; the right drum was perforated and draining profusely. No definite mastoid tenderness was made out. The spinal fluid was cloudy with many gram-positive diplococci visible in stained smears, which on culture proved to pneumococcus type I. The blood culture showed no growth.

Sulfonamide chemotherapy was begun immediately with 2.5 Gm. of sodium sulfapyridine intravenously. This intravenous dose was repeated in twelve hours, and therapy was then continued by administration of 2 per cent sodium sulfapyridine by rectum. There was immediate clinical improvement with a rapid fall in temperature. The spinal fluid was sterile after the third day of sulfonamide therapy. Cell count of the spinal fluid at first increased and then rapidly fell. Sulfapyridine therapy was started orally on November 12, but was changed again to rectal administration two days later because of considerable nausea and vomiting.

On November 7, left myringotomy was performed and pus obtained from which pneumococci were grown. X-rays of the mastoid processes were abnormal and in keeping with bilateral mastoiditis, and it was thought that the patient's meningitis might have been otitic in origin. On November 24, a right mastoidectomy was performed, revealing much necrotic bone and breakdown of mastoid cells but no direct gross extension to the meninges. Postoperative course was uneventful until November 27, at which time his temperature rose to 39.7° C.; and a lumbar puncture revealed 1,000 cells. There was question whether organisms were present in stained smear at this occasion, but the culture was sterile. Drug dosage was immediately increased, and the temperature again fell to normal, and in the course of several days the spinal fluid was normal, containing only 10 cells. Chemotherapy was discontinued entirely on November 30, with no further recurrences of meningitis or of fever. Left mastoidectomy was performed on December 6, and again considerable necrosis was revealed but without apparent direct extension to the meninges. Chemotherapy was not employed at this time; however, the patient showed no reaction to the operation.

Throughout the course of hospitalization, there was no improvement in the patient's hearing. Since caloric tests showed no reaction, it was concluded that the deafness was of nerve origin.

The patient was re-examined on May 27, 1940. There was still bilateral total deafness but no other abnormal findings. Psychometric examination revealed superior intelligence. Pneumo-encephalogram was indeterminate because of failure of air to enter the ventricles.

CASE 13 (Chart 1 and Table II).—This 7-year-old boy, A. E., had had a mild upper respiratory infection for two weeks, and one week before admission he developed pain in his right side. There were also headache, earache, and fever for four days and projectile vomiting for three days. The patient was moribund on entry and lived only six hours after admission. In addition to definite meningeal signs, there were also bilateral otitis media and nasal hemorrhage. The spinal fluid was cloudy, containing 1,500 cells and many pneumococci which were typed directly as type III. Chemotherapy was administered with both sulfanilamide and sulfapyridine as follows: 35 c.c. of 1 per cent sulfanilamide solution were given intraspinously and 175 c.c. of sulfanilamide subcutaneously; 20 c.c. of 5 per cent sodium sulfapyridine were given intravenously. He expired before any further drug could be given. At autopsy a generalized purulent leptomeningitis was found together with an organizing bronchopneumonia of both lower lobes. The brain was slightly increased in size, weighing 1,400 grams. The leptomeninges of the frontal, parietal, and temporal lobes were covered by a greenish-yellow exudate. The convolutions were flattened and the sulci partially obliterated. Microscopically, the outermost portions of the convolutions showed beginning necrosis. No temporal bone studies were made.

CASE 14 (Charts 8 and 9 and Table II).—This 5-month-old girl, C. K., developed an acute upper respiratory infection on January 19, 1940, with temperatures as high as 104.3° F. She became increasingly fretful and irritable, and during the night she began to vomit. The following day convulsive twitchings, mainly right-sided, were noted; she began also to have difficulty in breathing and seemed very prostrated.

She was admitted to the hospital on January 20, in a seemingly moribund condition, comatose and in collapse, so that emergency stimulants were necessary to revive her. Physical examination revealed a right-sided hemiparesis, positive Brudzinski and questionably positive Kernig signs, and an acute infection of the upper respiratory tract. There was also bilateral otitis media. The spinal fluid obtained was turbid with organisms, containing only 527 cells. Culture proved the organisms to be type XVIII pneumococcus. The leucocyte count was 27,000 with a marked left shift.

Following the initial use of stimulants, chemotherapy was begun with sulfapyridine orally and intravenously. She remained stuporous and continued to have convulsive twitchings for the next several days. On January 23, right lower pneumonia was discovered. On January 25 and 26, the temperature was normal, and clinical improvement was definite. On the following day, January 27, however, the temperature rose sharply, and the spinal fluid became more turbid. Drug dosage was increased, but high temperature and positive spinal fluid smears and cultures persisted. On February 6, 50,000 units of type XVIII rabbit antipneumococcus serum were given into the cistern, and during the next four days a total of 200,000 units more by the same route. Despite oral and intravenous sulfapyridine in doses approximating 0.4 Gm. per kilogram per twenty-four hours, the blood levels never exceeded 18 mg. per 100 c.c. The spinal fluid continued to show many organisms and a low cell count until the patient's death on February 23.

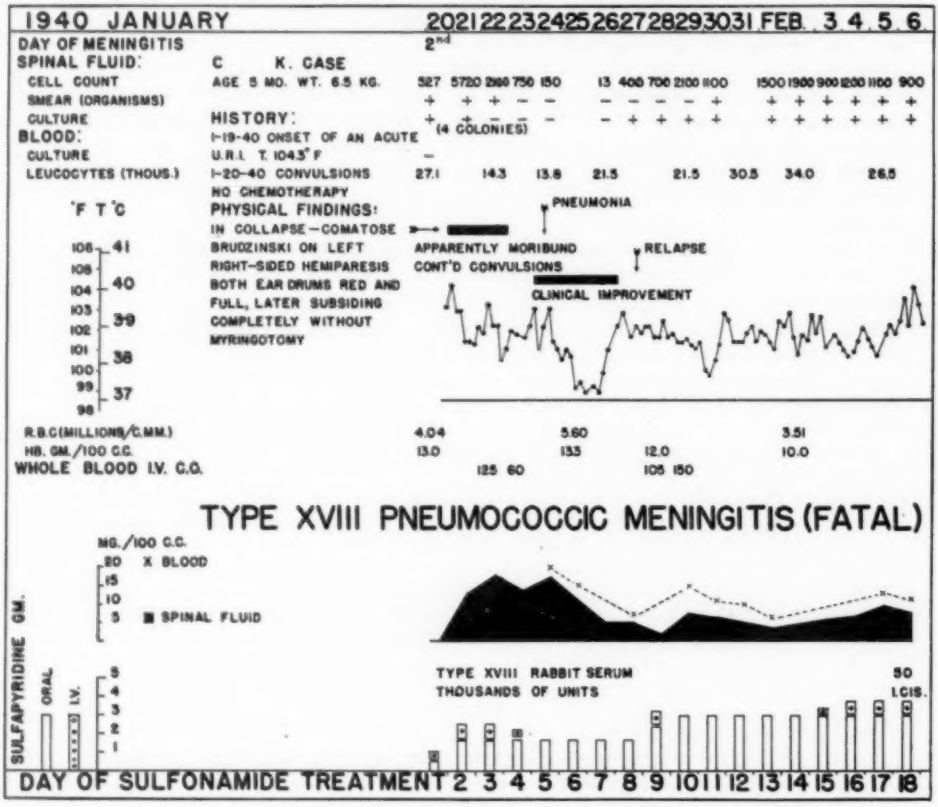


Chart 8.

The brain involvement as found at autopsy was described by Dr. W. O. Russell of the Department of Pathology as follows: There was a greenish-yellow exudate in the subarachnoidal space, most marked over the basilar structures but extending into both lateral fissures and scattered over the convexities of both cerebral hemispheres and cerebellum. In the left frontoparietal region there was an irregularly outlined blackish-red area with subarachnoidal hemorrhage. A mid-horizontal section revealed lateral and third ventricles markedly dilated.

Post-mortem examination of lungs revealed a slight lipoid pneumonia and both recent and organized thrombi of pulmonary vessels. Temporal bone studies were not made.

CASE 15 (Charts 10 and 11 and Table II).—This 8-year-old girl, M. A. S., was said to have had frequent attacks of sinusitis since the age of 3, the attacks being characterized

by severe frontal headaches, fever, and signs of nasal inflammation and obstruction. On February 12, 1940, she fell down seven concrete steps, injuring particularly her face. For twenty-four hours rather severe rhinorrhea occurred, the nasal discharge being at first apparently pure blood. Later it became watery and then ceased. Two days after the injury the child became restless and vomited. Then she became stuporous and disoriented and was sent to St. Louis Children's Hospital on February 15.

Her condition was that of stupor with marked rigidity of the neck, positive Kernig's sign bilaterally and pathological toe signs on the left. Temperature was 39.8° C. Her nose was bruised and swollen with ecchymosis particularly at the glabella. There was considerable postnasal purulent discharge. X-ray was suggestive, but not conclusive, of a fracture of the floor of the right frontal sinus. Lumbar puncture revealed the spinal fluid to be under the pressure of 450 mm. of water and to be turbid, the cell count being 2,240.

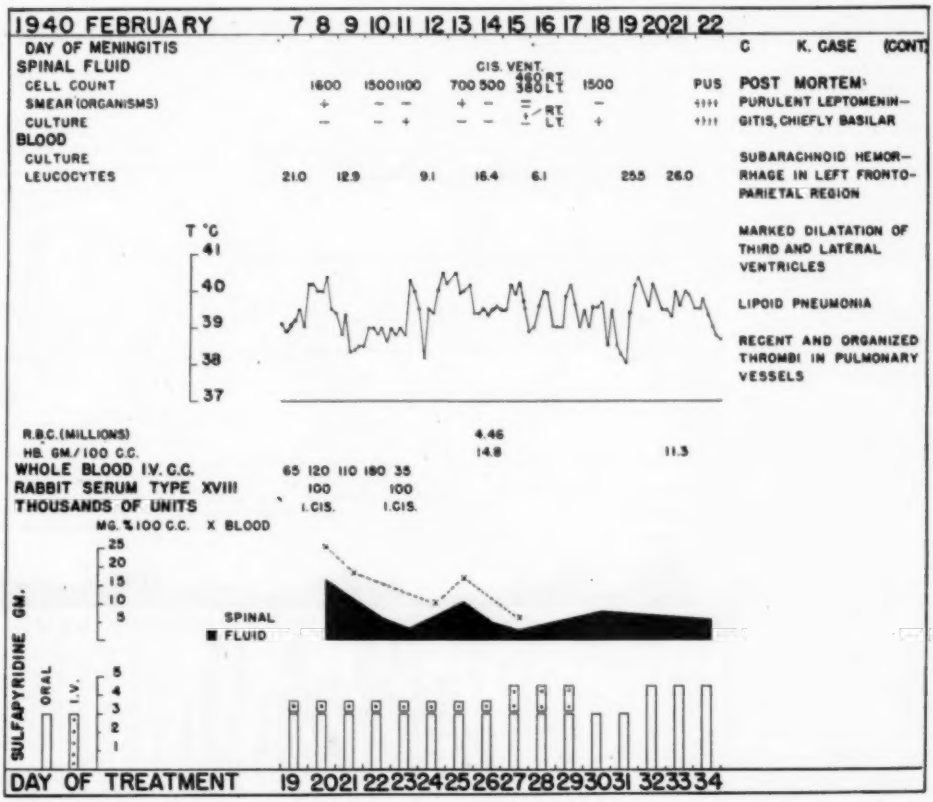


Chart 9.

Gram-positive cocci could be seen. During the next twenty-four hours, 4.5 Gm. sulfanilamide were administered, and a blood concentration of 12.4 mg. per 100 c.c. was obtained. At that time because the infecting organism was identified as the pneumococcus type VI, sulfapyridine was substituted for sulfanilamide, and during the next thirty-six hours, 9 Gm. were administered by the combined intravenous and oral routes. During this period the temperature had become almost normal, and the spinal fluid cell count had increased to 4,300. This behavior of the spinal fluid was misinterpreted as being an indication for continuous spinal fluid drainage, and drainage by the ureteral catheter method was begun on February 16. The child at this time was intensely cyanotic due to methemoglobin accumulation. Such cyanosis was promptly relieved by methylene blue administration. Because the child was not taking fluid well by mouth, fluid was given parenterally in apparently adequate amounts. Nevertheless, on the following day hematuria developed and

was considered (probably also erroneously) as an indication for greatly reducing the sulfapyridine dosage, and on February 18 and 19, 2 Gm. only of sulfapyridine were administered daily, with a resulting fall of spinal fluid concentration, return of fever, increase in meningeal signs and symptoms, and increase in turbidity of spinal fluid. The pneumococcus continued to be grown from culture. Sulfapyridine dosage was then increased, some of the drug being given intravenously, and soon afterwards the cell count of the spinal fluid diminished, and the pneumococci disappeared. A mannite-fermenting staphylococcus, however, soon appeared and continued to grow out from the spinal fluid culture. This fact, coupled with the continued fever and persistence of meningeal signs, suggested that a real staphylococcus meningitis was present, and for this reason sulfamethylthiazole therapy was substituted for sulfapyridine. No change in the condition followed, and on February 28, both sulfamethylthiazole and sulfapyridine were administered. The dosage of each drug averaged about 6 Gm. per day for the next eight days. Toward the end of this

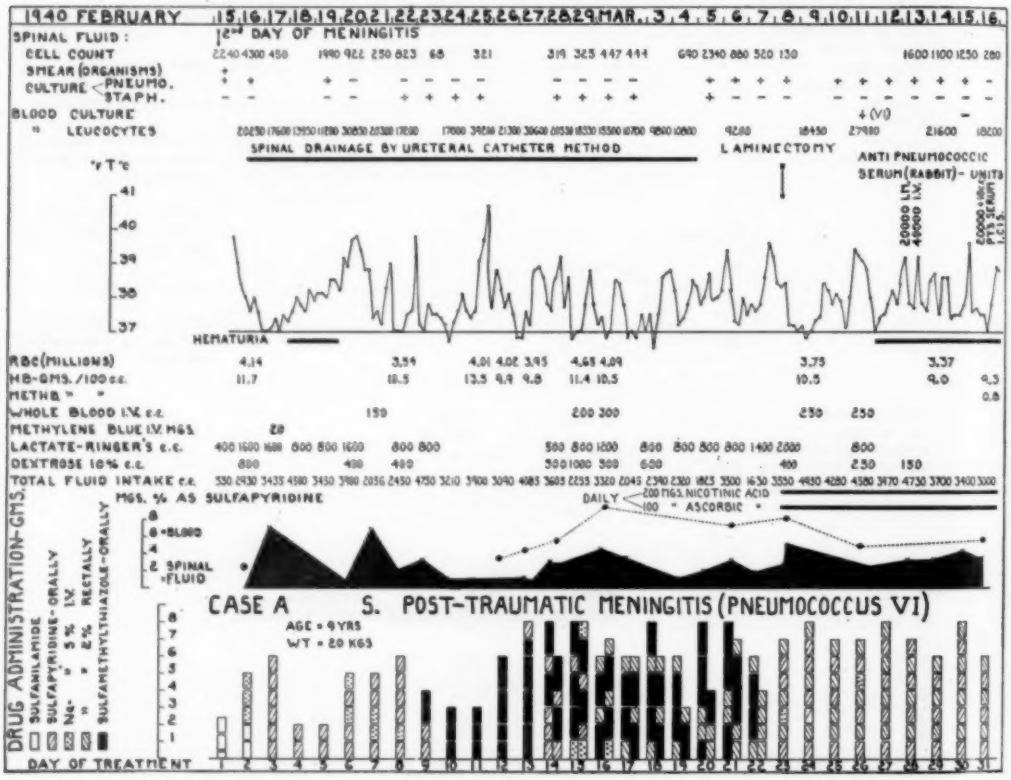


Chart 10.

period the spinal fluid concentration expressed as sulfapyridine fell to a low level, probably because of two factors: (1) The rectal administration of the sulfapyridine with poor and variable absorption, and (2) the relative nondiffusibility of sulfamethylthiazole into the spinal fluid. On March 4, the ureteral catheter was no longer functioning as a satisfactory drain and was removed. Quite promptly the staphylococci disappeared from the spinal fluid. The pneumococcus, however, returned probably due more to the fall in spinal fluid concentration and disappearance of the staphylococci than due to the withdrawal of the catheter. Drainage by laminectomy was then thought advisable and made on March 8, without change in the general picture. On March 11, the blood culture as well as the spinal fluid culture grew out the type VI pneumococcus.

It was then decided to administer antipneumococcus rabbit serum and to continue with sulfapyridine administration in high dosage, adopting all possible measures to reduce the toxicity of the drug. For this reason, nicotinic acid and ascorbic acid were adminis-

tered with the hope of more easily controlling the methemoglobinemia. It was soon found out, however, that they were not nearly as effectual as methylene blue in preventing the accumulation of methemoglobinemia. At this time it was noticed that the patient's own serum contained a considerable antibody titer to the type VI pneumococcus. Consequently, some of the patient's fresh serum was administered along with the rabbit serum to secure additional antibody administration and to be certain of providing complement. The first administration of serum was made intramuscularly and intravenously and then into the cistern (see Chart 10). After three injections, the spinal fluid became much clearer. However, considerable fever persisted, and after a sharp rise to 40.4° C. on March 27, a blood culture taken the following day grew out staphylococcus. Blood culture was positive for staphylococcus on March 27 but negative on March 28. The significance of this finding certainly was not clear. On the following day maxillary antral irrigation revealed pus

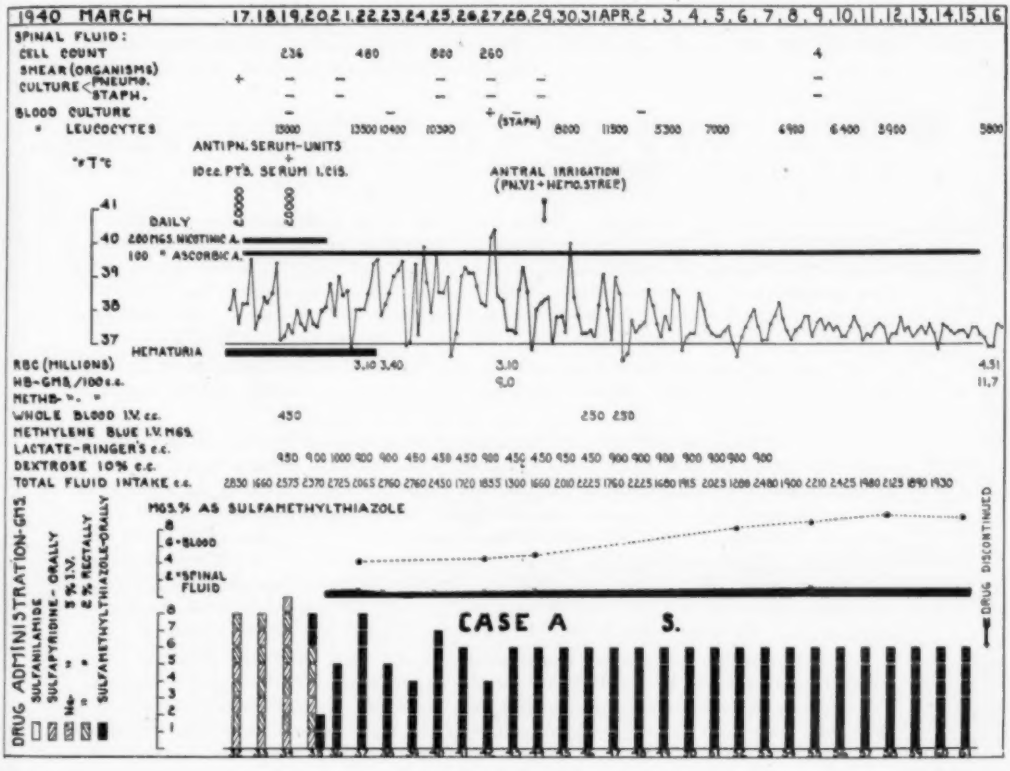


Chart 11.

from which the type VI pneumococcus together with a hemolytic streptococcus grew. At this time sulfamethylthiazole had been substituted for sulfapyridine with fairly good blood but low spinal fluid concentrations.

Improvement continued until a normal temperature was reached with complete recovery toward the middle of April when chemotherapy was entirely discontinued. The complexity and the long duration of this child's illness were, of course, outstanding, and all of us who were close to the problem were impressed by the following points: (1) Serum administration was of real value and had been delayed too long. (2) The appearance of hematuria following institution of the sulfonamide drugs should not necessarily be considered as an indication for cessation of treatment or reduction of dosage. The danger from infection should always be weighed against the danger of possible renal injury. (3) Sulfamethylthiazole and sulfathiazole, diffusing poorly into the spinal fluid, probably are of little value in the treatment of meningitis. (4) Mechanical means of securing continued spinal fluid drainage, such as the catheter method in particular, makes it difficult

to evaluate culture reports of spinal fluid even though samples are secured by puncture above the level of drainage. It was finally our impression that the staphylococcus cultures from the spinal fluid after catheterization was instituted represented merely local contamination.

This girl was seen again when 13 years old on June 13, 1944, slightly more than four years after her recovery from meningitis. Her only complaint for the interim was of occasional mild headaches. She had completed seventh grade in school and had done well in every way. Mental appraisal by one of us (B. S. K.) revealed a mental age of 14 years, 10 months, and an I.Q. of 113, considered consistent with superior intelligence.

CASE 16 (Table II).—This 3-year-old boy, R. M., was first hospitalized as a private patient on April 12, 1940. He had developed an upper respiratory infection on April 3, accompanied by fever and convulsions. On April 6, he was discovered to have a left lower lobar pneumonia for which he was treated with sulfapyridine with prompt improvement. Three days previous to this entry, he became restless, and the temperature again rose. In the hospital he was found to have a left lobar pneumonia and a left empyema due to the pneumococcus type XIX. Chemotherapy was administered as sulfamethylthiazole, and he was discharged after a stay of five days.

He was readmitted on April 26, because of intermittent fever and evidence of reaccumulation of fluid at the left base. There was also evidence of unresolved pneumonia of the left upper lobe. On the day following entry, intercostal drainage of a small pocket of pus was established, and he was again sent home on May 16.

Three days later he began to have a very high fever again, and four days after this, May 23, he was readmitted to the hospital. Aspiration of the chest was attempted at several sites, but no pus was obtained. A white blood cell count of 12,100 with only 9 per cent granulocytes was noted. He had not received any chemotherapy during the seven days out of the hospital, nor was he given any during this admission. The temperature fell gradually, and the granulocytes rose. He was discharged again on May 31.

He was seen again for a short while on June 22, because of complaints of listlessness and stiff neck. No other abnormal neurological findings were present, and the spinal fluid showed no abnormality.

His final entry was on August 1, at which time he entered the hospital in a moribund condition, dying an hour after entry. The previous afternoon he had begun to complain of severe headache, had fever of 103° F., and began to vomit. During the night he had convulsive twitchings of the left arm and lapsed into a stupor. Physical examination on entry revealed him to be acutely ill and stuporous with a temperature of 40.4° C. Respiration was labored and irregular. The right pupil was larger than the left with no response to light in either. Both disks were choked. He appeared somewhat emaciated. The neck was stiff; there was a right sixth nerve paralysis, and the deep reflexes on the left were hyperactive. The impression at this time was that he had a metastatic brain abscess.

Permission for post-mortem examination for the brain only was obtained. Report of findings at autopsy by Dr. F. Brown of the Department of Pathology were as follows: Convolutions of both cerebral hemispheres were flattened. A small focus of faintly cloudy fluid was present in the subarachnoid space of the right parietal lobe near the superior sagittal sinus. A small focus of delicate adhesions between the leptomeninges and the dura was noted over the left parietal lobe 3 cm. lateral to the superior sagittal sinus. Frank pus was present in the subarachnoid space subjacent to this, and the leptomeninges over the entire left parietal eminence had a cloudy appearance. This yellowish fluid was present in the posterior fossa around the pons and medulla oblongata. The leptomeninges were thickened in this area and contained thick, grayish, gelatinous material. Examination of the brain after fixation revealed an abscess in the parietal and temporal lobes of the right side about 3 cm. in diameter, filled with pus and extending into the lateral ventricle on the right side. Cultures taken at autopsy from several areas in the meninges grew out both hemolytic *Staphylococcus aureus* and pneumococcus. No studies of the temporal bones were made.

CASE 17 (Chart 12 and Table II).—This 3-month-old infant, C. M., had had an upper respiratory infection three weeks previously with improvement after three days of cough and fever. He was quite well then until thirty-six hours before entry, at which time he became very irritable and restless and began to vomit. He seemed to have fever and cried constantly. No chemotherapy was given before entry. Physical findings on admission were those of acute

toxicity and extreme prostration. There appeared to be impending circulatory collapse. There were no signs of upper respiratory infection or otitis media. The spinal fluid was cloudy with 874 cells, and gram-positive diplococci seen on smear later proved to be type V pneumococcus. Treatment was begun with parenteral fluid therapy and sodium sulfapyridine intravenously, but there was no improvement, and he died within twelve hours after entry. Blood culture was positive for type V pneumococcus. The coroner's autopsy revealed diffuse purulent meningitis. No temporal bone studies were made.

CASE 18 (Chart 12 and Table II).—This 22-month-old infant, P. Z., born prematurely, entered the hospital at the age of 6 weeks with a respiratory infection and otitis media. There were subsequently recurring attacks of respiratory infection with two other hospital entries. On both occasions otitis media and bronchitis were present. She had marked mental deficiency and was severely malnourished. Six weeks before her final admission to the hospital she had simultaneous pertussis and measles with a recurrence at that time of purulent otitis media with high fever. She then had a persistent cough and discharging ear. Two days before entry she again developed a high fever and began to vomit. No chemotherapy was given outside the hospital.

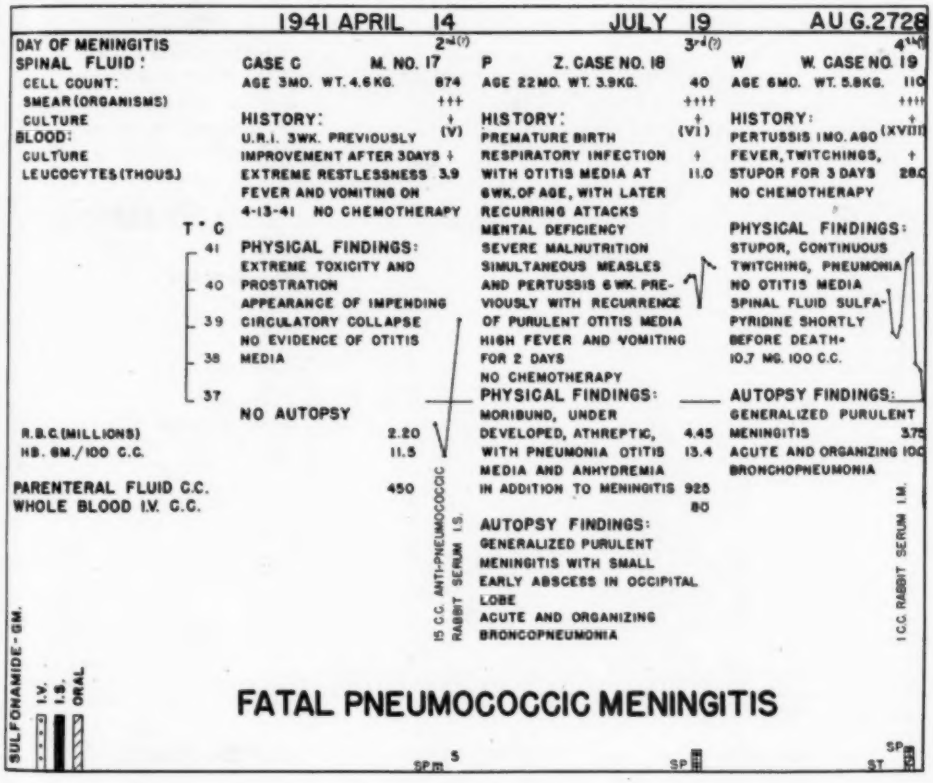


Chart 12.

Physical examination at final entry revealed her to be poorly developed, markedly malnourished. Signs of meningitis were quite marked. There were present otitis media, pneumonia, and anhydremia. The spinal fluid showed a turbidity due to bacteria with a cell count of only 40. Gram-positive diplococci seen on stained smear were typed directly as type VI pneumococcus, and a blood culture was positive for the same organism. The child was moribund on admission and showed no response to treatment which consisted of parenteral fluid therapy and sodium sulfapyridine given both intravenously and intraspinously, in the latter case as a 2 per cent solution of the sodium salt. A small blood transfusion had also been given.

Autopsy findings as reported by Dr. W. Kenny of the Department of Pathology were as follows: The arachnoid was raised by a thick yellowish-green viscous exudate which covered all surfaces of the brain including the base. The convolutions appeared flattened; the sulci were obliterated by a thick yellowish-green exudate. The dura and pia-arachnoid of the spinal cord were not remarkable. The leptomeninges were thickened and milky white, and in the white matter of the left occipital lobe there was an area of softening resembling caseation which measured 10 mm. in diameter. In addition to the findings of the brain and meninges, there was an acute organizing bronchopneumonia of all lobes of the lungs. No temporal bone studies were made.

CASE 19 (Chart 12 and Table II).—W. W., age 6 months, had had pertussis one month previously. Anorexia, fever, stupor, and convulsive twitchings of the extremities were present three days before entry. On admission to the hospital on August 27, 1941, he was seen to be in a stuporous condition with continuous twitchings of the extremities. There were signs of bronchopneumonia in both lung fields but no evidence of otitis media. The spinal fluid was opalescent, containing 110 cells and numerous gram-positive diplococci, which on the following day were found to be pneumococcus type XVIII. Blood culture was also positive for pneumococcus type XVIII.

The first treatment consisted of intravenous sodium sulfathiazole and parenteral fluid therapy. On the second hospital day treatment was changed to sulfapyridine with the first dose being given intravenously as the sodium salt. Fifty thousand units of rabbit type XVIII antipneumococcus serum were given intramuscularly. Throughout this period the child was kept in an oxygen tent continuously. In spite of the above measures, he showed no improvement and expired on the second hospital day.

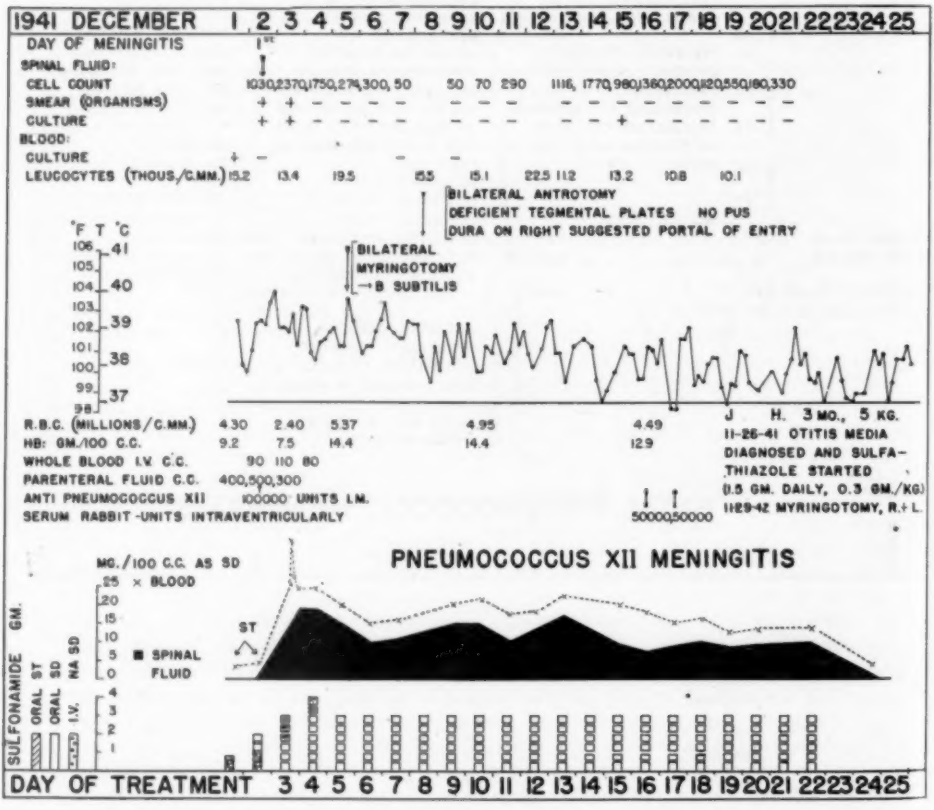

1941 DECEMBER 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
DAY OF MENINGITIS 1ST
SPINAL FLUID:
CELL COUNT 1030, 2370, 1750, 276, 300, 50 50 70 290 1116, 1770, 960, 360, 2000, 120, 550, 180, 330
SMEAR (ORGANISMS) + + − − − − − − − − − − − − − − − −
CULTURE + + − − − − − − − − − − + − − − − − −
BLOOD:
CULTURE + − − − −
LEUCOCYTES (THOUS./C.MM.) 15.2 13.4 19.5 15.5 15.1 22.5 11.2 13.2 10.8 10.1
BILATERAL ANTROTOMY
DEFICIENT TEGMENTAL PLATES NO PUS
DURA ON RIGHT SUGGESTED PORTAL OF ENTRY
°F T °C
106 41
105
104 40
103
102 39
101
100 38
99
98 37
BILATERAL MYRINGOTOMY → B SUBTILIS
R.B.C. (MILLIONS/C.MM.) 4.30 2.40 5.37 4.95 4.49
HB: GM./100 C.C. 9.2 7.5 14.4 14.4 12.9
WHOLE BLOOD I.V. C.C. 90 110 80
PARENTERAL FLUID C.C. 400, 500, 300
ANTI PNEUMOCOCCUS XII 100000 UNITS I.M.
SERUM RABBIT-UNITS INTRAVENTRICULARLY
50000, 50000
J H. 3 MO., 5 KG.
11-26-41 OTITIS MEDIA
DIAGNOSED AND SULFA-
THIAZOLE STARTED
(0.5 GM. DAILY, 0.3 GM./KG)
11-29-41 MYRINGOTOMY, R.+L.
PNEUMOCOCCUS XII MENINGITIS
MG./100 C.C. AS SD
25 × BLOOD
20
15
10
5 ■ SPINAL FLUID
0
ST
SULFONAMIDE GM.
ORAL ST
ORAL SD
NA SD
I.V.
4
3
2
1
DAY OF TREATMENT 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Chart 13.

At autopsy by Dr. W. Stahl of the Department of Pathology, the meninges were found to be filled with thick greenish pus, and in addition there were both acute and organizing bronchopneumonia of the upper lobes of both lungs, more marked on the right. No temporal bone studies were made.

CASE 20 (Chart 13 and Table II).—This 3-month-old infant, J. H., had been ill for two weeks previous to hospital entry with anorexia, fever, and fretfulness. She had been seen several times in the receiving room of the hospital, and otitis media was found and treated with sulfathiazole, 0.25 Gm. every four hours. There was but little improvement, and two days before hospital admission when she was again seen in the receiving room, bilateral myringotomy was performed. Fever continued to range between 101° and 102° F., and two days later because of no improvement, she was admitted to the hospital. For the first twelve hours sulfonamide therapy was continued as sulfathiazole, 0.125 Gm. every four hours. The following morning it was noticed that the fontanelle was full although there was no neck rigidity, positive Kernig or Brudzinski signs. The ears at this time were not draining and seemed definitely to have improved. Lumbar puncture obtained cloudy fluid with 1,010 cells and gram-positive diplococci which were later typed as pneumococcus type XII. A blood culture taken the previous day grew out the same type of pneumococcus.

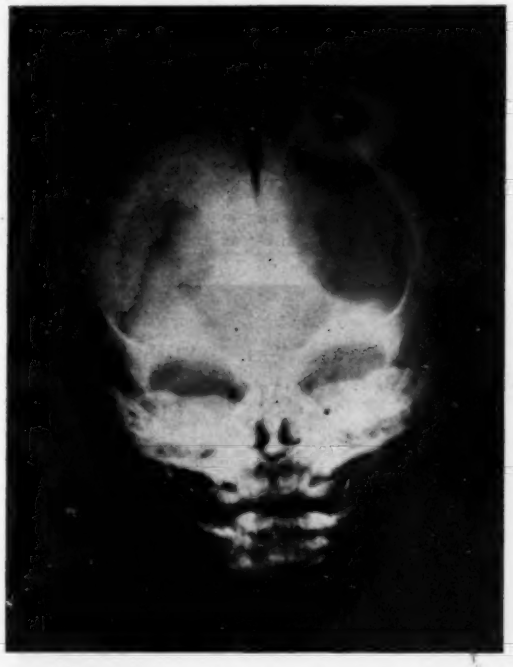


Fig. 5 (Case 20).—Encephalogram, A-P view, showing extreme dilatation of posterior horns of the lateral ventricles (Evans index .708). Other views showed commensurate enlargement of other portions of lateral ventricles. Note absence of air in subarachnoid space.

With the revelation of the presence of meningitis, which may have been present prior to the day of lumbar puncture, sulfathiazole was changed to sulfadiazine both intravenously and orally. On this same day, 100,000 units of antipneumococcus rabbit serum were administered intramuscularly. In spite of high dosage of sulfadiazine with blood and spinal fluid concentrations maintained between 15 and 25 mg. per 100 c.c., the temperature remained continuously elevated. However, after the second day on chemotherapy, the spinal fluid cultures were consistently negative as were the blood cultures, and the cell count of the spinal fluid dropped steadily.

Since both ears remained reddened and full, on December 5, bilateral myringotomy was performed; but cultures obtained only *Bacillus subtilis*. On December 8, while the

child was still under intensive chemotherapy, bilateral antrotomy was performed to eliminate the mastoids as possible sources of infection causing the continued elevation of temperature. At operation, deficient tegmental plates in both mastoids were revealed, but there was no pus. Examination of the dura on the right side suggested that this was the portal of entry for the infection.

Following the operation, the fever continued unabated; and the cell count of the spinal fluid began to rise although all cultures still proved sterile until December 15, at which time five colonies were grown from centrifuged sediment. At this time the spinal fluid cell count was 980. On the following day, spinal fluid was removed from the right ventricle and replaced with antipneumococcus type XII rabbit serum, 50,000 units being given. This procedure was repeated the next day on the left side again introducing 50,000 units. Throughout this period, the patient had remained on oral dosage of sulfadiazine; however, on December 22, all chemotherapy was discontinued because it was felt at this time that the continued low-grade elevation of temperature might be due to drug fever. Following discontinuation of the drug, the same low-grade fever and mild elevation of cell count in the spinal fluid persisted until January 6, 1942, on which date a pneumo-encephalogram was performed after preparation of the patient for twenty-four hours with sulfadiazine orally, 0.4 Gm. per kilogram. The pneumo-encephalogram revealed an internal hydrocephalus with dilatation of the ventricular system (Fig. 5). This procedure was unexpectedly followed by an immediate and very striking improvement in the patient's condition. The temperature fell to normal and remained there throughout the remainder of her hospital stay.

She was seen again on October 10, 1943, at 14 months of age, at which time she seemed quite alert, normally responsive, and developing normally. She could not be contacted later for special mental testing.

CASE 21 (Chart 14 and Table II).—This 5-year-old boy, R. K., had had a mild upper respiratory infection for ten days, when on the night of December 29, 1941, he developed a chill and complained of headache. The following morning he complained of an earache and began to vomit. At this time, his temperature was 102° F. Throughout the day he grad-

Fig. 6 (Case 21).—Encephalogram, P-A view, showing dilatation of anterior horns of the lateral ventricles (Evans index .33), left more than right, and some dilatation of third ventricle, slight increase in the subarachnoid space over the cortex on the left.

ually became stuporous, and in the early part of the afternoon began to show convulsive twitchings which were largely confined to the right side.

On physical examination the boy was comatose, showed clonic movements of the right side of the body, with a temperature of 104° F. There were still signs of mild upper respiratory infection. Both eardrums were intact but showed some injection and retraction. Neurological examination revealed the right pupil to be constricted, all deep tendon reflexes hypoactive, a stiff neck and spine, and a positive Brudzinski sign. A lumbar puncture revealed turbid spinal fluid under increased pressure, containing 810 cells, the cloudiness being mostly due to the presence of many gram-positive diplococci. By direct typing on the spinal fluid, these were determined to be type IV pneumococcus. Other laboratory data included a mild anemia, a white blood cell count of 34,000 with a definite left shift, and a negative blood culture.

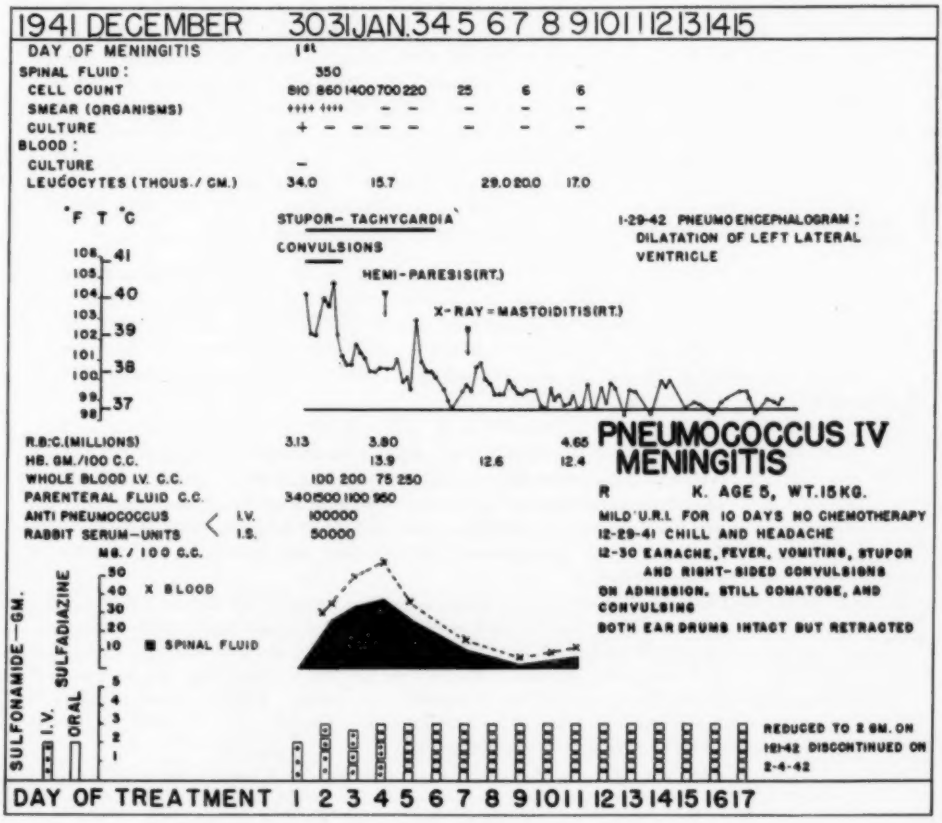

1941 DECEMBER 30 31 JAN. 3 4 5 6 7 8 9 10 11 12 13 14 15
DAY OF MENINGITIS 1st
SPINAL FLUID:
CELL COUNT 350 810 860 1400 700 220 25 6 6
SMEAR (ORGANISMS) ++++ ++++ - - - - -
CULTURE + - - - - - - -
BLOOD:
CULTURE -
LEUCOCYTES (THOUS./ CM.) 34.0 15.7 29.0 20.0 17.0
°F T °C
STUPOR - TACHYCARDIA
CONVULSIONS
HEMI-PARESIS (RT.)
X-RAY = MASTOIDITIS (RT.)
1-29-42 PNEUMOENCEPHALOGRAM: DILATATION OF LEFT LATERAL VENTRICLE
R.B.C. (MILLIONS) 3.13 3.80 4.65
HB. GM./100 C.C. 13.9 12.6 12.4
WHOLE BLOOD I.V. C.C. 100 200 75 250
PARENTERAL FLUID C.C. 340 500 100 950
ANTI PNEUMOCOCCUS I.V. 100000
RABBIT SERUM - UNITS I.S. 50000
PNEUMOCOCCUS IV MENINGITIS
R K. AGE 5, WT. 15 KG.
MILD U.R.I. FOR 10 DAYS NO CHEMOTHERAPY
12-29-41 CHILL AND HEADACHE
12-30 EARACHE, FEVER, VOMITING, STUPOR AND RIGHT-SIDED CONVULSIONS
ON ADMISSION, STILL COMATOSE, AND CONVULSING
BOTH EAR DRUMS INTACT BUT RETRACTED
MG. / 100 C.C.
SULFONAMIDE — GM.
SULFADIAZINE
I.V.
ORAL
X BLOOD
SPINAL FLUID
REDUCED TO 2 GM. ON 1-21-42 DISCONTINUED ON 2-4-42
DAY OF TREATMENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Chart 14.

The convulsions present on admission persisted for two days and were uncontrolled by the use of barbiturates. Therapy was begun with 2 Gm. sodium sulfadiazine intravenously, followed by 100,000 units of type IV rabbit antipneumococcus serum intravenously. The following day an additional 50,000 units were given intraspinally. The supportive measures included oxygen therapy, adequate parenteral administration of fluids, and several blood transfusions. With intravenous administration, sulfadiazine blood levels of 30 to 50 mg. per 100 c.c. were reached. Steady clinical improvement followed institution of these measures, and by the end of the first six days the temperature had dropped to normal, and the general condition was excellent. A second lumbar puncture on the second day of sulfonamide therapy revealed organisms still present in stained smear, but these failed to grow on culture. The spinal fluid cell count rose to 1,400 on the fourth day,

but by the seventh day had dropped to 6. Although convulsions ceased on the second day, the patient remained drowsy for several days. On January 2, 1942, he was discovered to have a right hemiparesis. He also had throughout this period a complete aphasia. Infection in the ears subsided with no drainage at any time; and although x-rays taken on January 5 showed evidence of right mastoiditis, it was decided that conservative treatment with chemotherapy would be adequate.

Marked weakness of the entire right half of the body persisted for the first two weeks; he was unable to say either words or phrases. Before discharge he had regained some strength on the right side and was able to say a few simple words. A pneumoencephalogram done on January 29, 1942, showed definite dilatation of the left lateral ventricle (Fig. 6). Following discharge from the hospital, he was seen several times, and apparently had regained use of the arm and leg, and there was some improvement in the aphasia. When seen in July, 1942, there was a report of a form of seizure resembling an epileptic equivalent. Mental examination at this time revealed an I.Q. of 69 per cent. At the last examination in March, 1943, he appeared to have definitely deteriorated. Speech was brief, meager, and difficult to understand. The I.Q. was 52 per cent (Stanford-Binet Form M) representing a loss in I.Q. of 17 points in eight months. When seen again on May 26, 1944, then 7 years, 10 months, of age, he had not been able to begin school. While he seemed willing, interested, and friendly, he still showed marked mental deficiency, his estimated I.Q. being 51 per cent. The latter represented a drop of 18 points in the previous two years, but no significant loss in the preceding fourteen months. Epileptic seizures still occurred but less frequently than before.

CASE 22 (Chart 15 and Table II).—This 7-year-old girl, B. W., had earache on December 23, 1941, continuing for two days and then subsiding. She seemed well until December 30, at which time she again began to complain of earache and to vomit. On December 31, she was started on sulfathiazole (dosage not known), and she seemed better. No fever accompanied this period of illness. However, on January 1, 1942, the temperature rose to 104° F., and she complained of a stiff neck.

On entry to the hospital on January 2, she was seen to be acutely ill with stupor, high fever, and signs of meningeal irritation. The eardrums were thickened and dull but did not seem acutely involved. There were no external signs of mastoiditis. The spinal fluid was turbid, but no organisms were seen on smear and none grown on blood agar culture. The diagnosis of pneumococcus type III meningitis was established only when the organisms were grown on the fertile egg. A Queckenstedt (Tobey-Ayer) test performed at the time of lumbar puncture was negative.

Treatment was instituted with intravenous sodium sulfadiazine and oral sulfadiazine, and this was followed by a prompt and marked clinical improvement. The dosage employed approximated 0.6 Gm. per kilogram per twenty-four hours, and blood levels as high as 45 mg. per 100 c.c. were obtained. There was hematuria persisting for several days but no oliguria, and the dosage of the drug was not reduced. An initial sharp decline in temperature and clinical improvement was followed by complete recovery, and the patient left the hospital after a stay of only eleven days.

This girl was seen again on May 29, 1944, a little over two years after recovery from meningitis. She had been apparently normal since her return home and was doing well in schoolwork. No physical abnormalities were found on this examination. The conclusion of the psychometric examination was as follows: The I.Q. of 109 is consistent with high average intelligence. Performance work is average. The only unfavorable findings are relatively poor work in spelling, poor motor-coordination in drawing, and relatively poor memory for designs.

CASE 23 (Table II).—This 17-month-old girl, D. M. P., had had an upper respiratory infection ten days previously and with it developed a hacking and paroxysmal cough which was accompanied by vomiting. There was no fever throughout this portion of her illness. Five days before entry, she became very listless and drowsy. She was admitted to the hospital on February 1, 1943, at which time she was seen to be very acutely ill, semicomatose, with rapid respirations of a deep and acidotic character, and was very dehydrated. There were bilateral acute otitis media and acute nasopharyngitis. Loud coarse rhonchi were heard throughout both lung fields. There were no signs of meningeal irritation at this time. Temperature was 40° C. Examination of the blood showed a white blood cell count of 76,000

with 49 per cent lymphocytes, supporting the impression of the presence of pertussis with complicating respiratory infection. Lumbar puncture done at this time revealed a clear fluid with a cell count of 17 lymphocytes. No organisms were seen on smear, but an abundant growth of pneumococcus XIV was unexpectedly obtained.

Treatment was begun with intravenous sodium sulfadiazine. In addition to chemotherapy, supportive therapy was given, consisting of oxygen, liberal amounts of parenteral fluids, and transfusions. On her second hospital day, she was given 10 c.c. of antipertussis rabbit serum intravenously and intramuscularly. On this same day, a repeat white blood cell count showed leucocytes to be 106,000 with 62 per cent lymphocytes. On her third hospital day, there was some clinical improvement. At this time, however, the culture report from the original spinal fluid examination was available, revealing the growth of the pneumococcus. Lumbar puncture was repeated on this day and showed 160 cells. Stained smear of this spinal fluid was negative for organisms but on the day following revealed an abundant growth. A blood culture taken on the day of entry was also found to show a growth of pneumococcus type XIV. No improvement followed therapeutic measures, and the child died on the third hospital day.

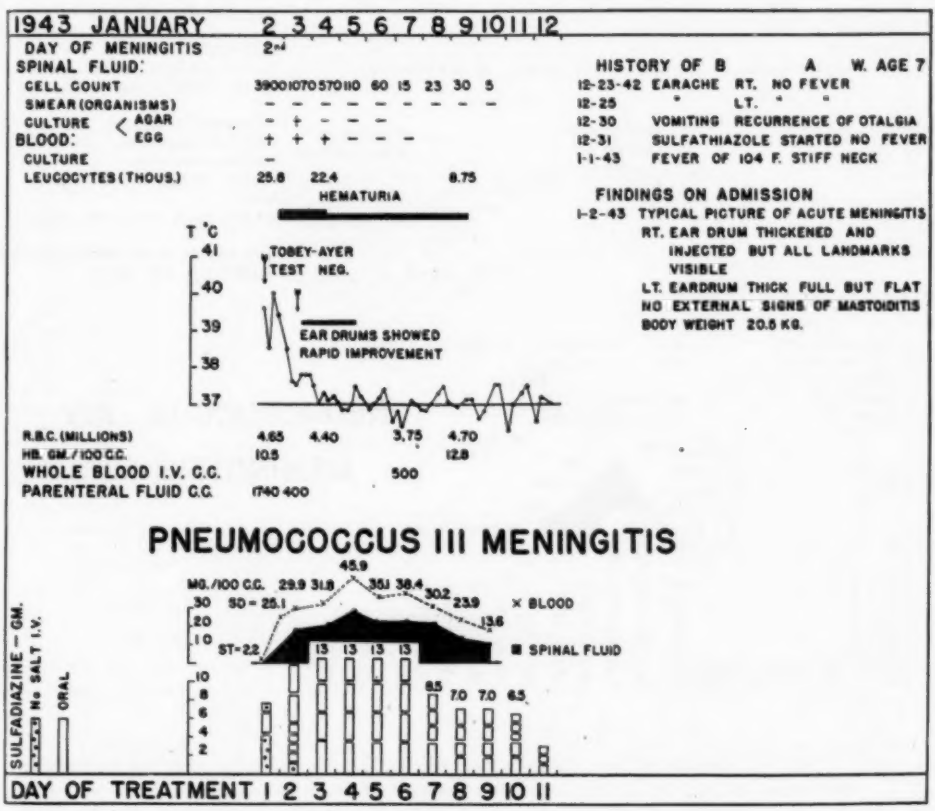

1943 JANUARY 2 3 4 5 6 7 8 9 10 11 12
DAY OF MENINGITIS 2nd
SPINAL FLUID:
CELL COUNT 3900 1070 570 110 60 15 23 30 5
SMEAR (ORGANISMS) - - - - - - - - -
CULTURE - + - - -
BLOOD: AGAR - + - - -
EGG + + + - - -
CULTURE -
LEUCOCYTES (THOUS.) 25.6 22.4 8.75
HEMATURIA
HISTORY OF B A W. AGE 7
12-23-42 EARACHE RT. NO FEVER
12-25 " LT. " "
12-30 VOMITING RECURRENCE OF OTALGIA
12-31 SULFATHIAZOLE STARTED NO FEVER
1-1-43 FEVER OF 104 F. STIFF NECK
FINDINGS ON ADMISSION
1-2-43 TYPICAL PICTURE OF ACUTE MENINGITIS
RT. EAR DRUM THICKENED AND INJECTED BUT ALL LANDMARKS VISIBLE
LT. EARDRUM THICK FULL BUT FLAT
NO EXTERNAL SIGNS OF MASTOIDITIS
BODY WEIGHT 20.6 KG.
T °C
41
40
39
38
37
TOBEY-AYER TEST NEG.
EAR DRUMS SHOWED RAPID IMPROVEMENT
R.B.C. (MILLIONS) 4.65 4.40 3.75 4.70
HB. GM./100 C.C. 10.5 12.8
WHOLE BLOOD I.V. C.C. 500
PARENTERAL FLUID C.C. 1740 400
PNEUMOCOCCUS III MENINGITIS
MG./100 C.C. 29.9 31.8 45.9 35.1 38.4 30.2 23.9 13.6
30
20
10
SD = 25.1
ST=22
× BLOOD
■ SPINAL FLUID
13 13 13 13
10
8
6
4
2
8.5 7.0 7.0 6.5
SULFADIAZINE — GM.
No SALT I.V.
ORAL
DAY OF TREATMENT 1 2 3 4 5 6 7 8 9 10 11

Chart 15.

CASE 24 (Chart 16 and Table II).—This 3½-year-old boy, C. C., had had a previous febrile illness in December, 1942. He had seemed quite well, however, until three days previous to entry, at which time he became somewhat listless and had fever. The following day he seemed better and played normally. On February 7, 1943, he suddenly became very acutely ill with a high fever of 104° F. and delirium. The following morning, he was stuporous and breathing irregularly with periods of apnea and deep sighing respirations.

On entry on February 8, physical examination revealed the irregular breathing mentioned in the history. There was a slightly stiff neck with positive Kernig and Brudzinski

signs. The right eardrum was thick, dull, and injected. Lumbar puncture obtained cloudy spinal fluid with a cell count of 3,160, and numerous organisms were typed directly as pneumococcus type XIV.

An original dose of sodium sulfadiazine of 2 Gm. was given intravenously. Chemotherapy was then continued as 0.5 per cent sodium sulfadiazine subcutaneously, supplemented by oral dosage to a total amount approximating 0.6 Gm. per kilogram for twenty-four hours. On February 8, 100,000 units of type XIV antipneumococcus serum were given intramuscularly. Despite a liberal fluid intake, microscopic hematuria developed on February 9 and persisted five days. Very high blood levels were obtained with a level of 59.6 present in the blood on February 10. Clinical improvement was rapid, and he was discharged on February 21, after a hospital stay of thirteen days, at which time the right eardrum appeared almost normal.

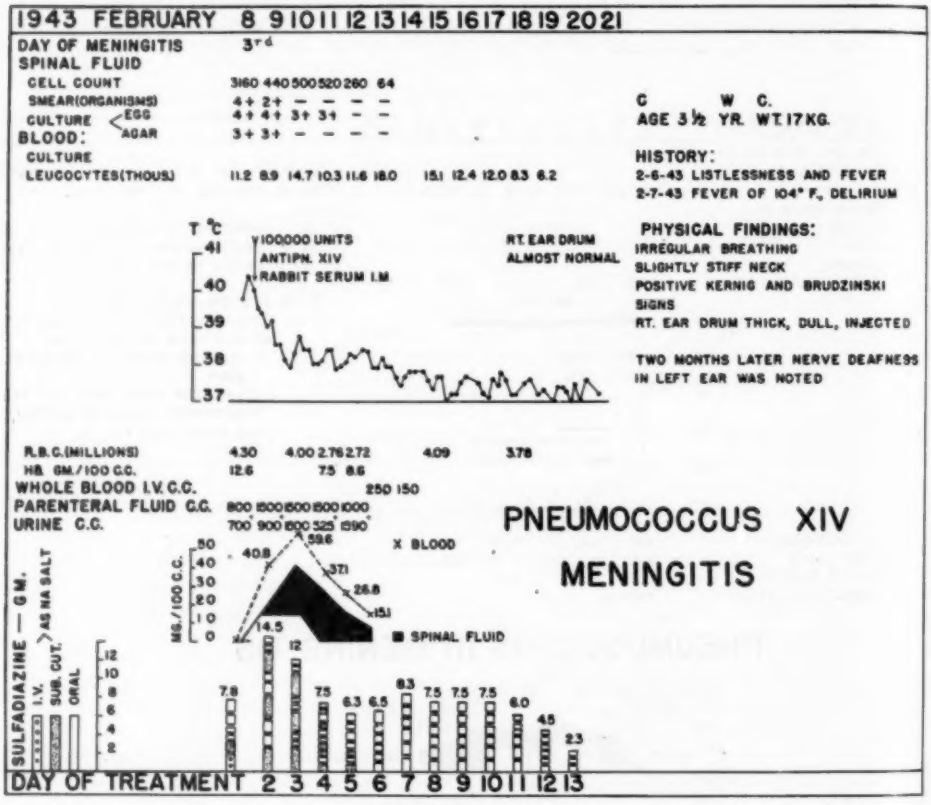

1943 FEBRUARY 8 9 10 11 12 13 14 15 16 17 18 19 20 21
DAY OF MENINGITIS 3rd
SPINAL FLUID
CELL COUNT 3160 440 500 520 260 64
SMEAR(ORGANISMS) 4+ 2+ – – – –
CULTURE EGG 4+ 4+ 3+ 3+ – –
BLOOD: AGAR 3+ 3+ – – – –
CULTURE
LEUCOCYTES(THOUS) 11.2 8.9 14.7 10.3 11.6 18.0 15.1 12.4 12.0 8.3 6.2
C W C.
AGE 3½ YR. WT. 17 KG.
HISTORY:
2-6-43 LISTLESSNESS AND FEVER
2-7-43 FEVER OF 104° F., DELIRIUM
T °C
100000 UNITS ANTIPN. XIV RABBIT SERUM I.M.
RT. EAR DRUM ALMOST NORMAL
PHYSICAL FINDINGS:
IRREGULAR BREATHING
SLIGHTLY STIFF NECK
POSITIVE KERNIG AND BRUDZINSKI SIGNS
RT. EAR DRUM THICK, DULL, INJECTED
TWO MONTHS LATER NERVE DEAFNESS IN LEFT EAR WAS NOTED
R.B.C.(MILLIONS) 4.30 4.00 2.76 2.72 4.09 3.78
HB. GM./100 C.C. 12.6 7.5 8.6
WHOLE BLOOD I.V. C.C. 250 150
PARENTERAL FLUID C.C. 800 1500 500 1500 1000
URINE C.C. 700 900 600 325 1590
PNEUMOCOCCUS XIV
MENINGITIS
X BLOOD
MG./100 C.C.
40.8 59.6 37.1 26.8 15.1 14.5
SPINAL FLUID
SULFADIAZINE — G.M.
I.V. 4% NA SALT
SUB. CUT.
ORAL
7.8 12 7.5 6.3 6.5 8.3 7.5 7.5 7.5 6.0 4.5 2.3
DAY OF TREATMENT 2 3 4 5 6 7 8 9 10 11 12 13

Chart 16.

On re-examination two months after discharge, a 75 per cent reduction in hearing was found in the left ear, the deafness presumably being of nerve origin. This appeared to be the only residual. Mental appraisal on March 31, 1943, was as follows: The Stanford-Binet examination showed a mental age of 3 years and 9 months and an I.Q. of 107. Because of somewhat indifferent interest, the I.Q. is probably not fully representative of inherent intellectual endowment.

He was seen again on June 5, 1944, about eighteen months after his recovery from meningitis. The interval history was not remarkable except that in March of that year he was thought to have had a mild infection in the right ear. He still did not hear very well from the left ear. Physical examination at this time revealed no other abnormalities. Mental appraisal at this time was as follows: There was a mental age of 4 years and 10 months

and an I.Q. of 102. This I.Q. is consistent with average intelligence, and the loss of 5 points of I.Q. in the past fourteen or fifteen months may not be very serious since there is a good deal of variation in the earlier years. Low scores in performance and marginal work in drawing of a man may be interpreted as unfavorable signs.

CASE 25 (Charts 17, 18, 19 and Table II).—This 8-month-old infant, G. W., had had an upper respiratory infection in February, 1943. At this time due to an overdosage of a cough medicine, he entered the hospital almost moribund from acute narcotic poisoning, having apparently received about 1½ grains of codeine. He recovered rapidly from this and was quite well until June 1, at which time there was a mild upper respiratory infection with slight fever. Onset of meningeal symptoms was on June 8, with irritability, restlessness, and crying followed by vomiting. Admission to the hospital was on June 10, on apparently the second day of the meningitis. For a short period, he was in another hospital and received some sulfonamide chemotherapy, and on admission had a blood concentration of 2.1 mg. expressed as sulfadiazine.

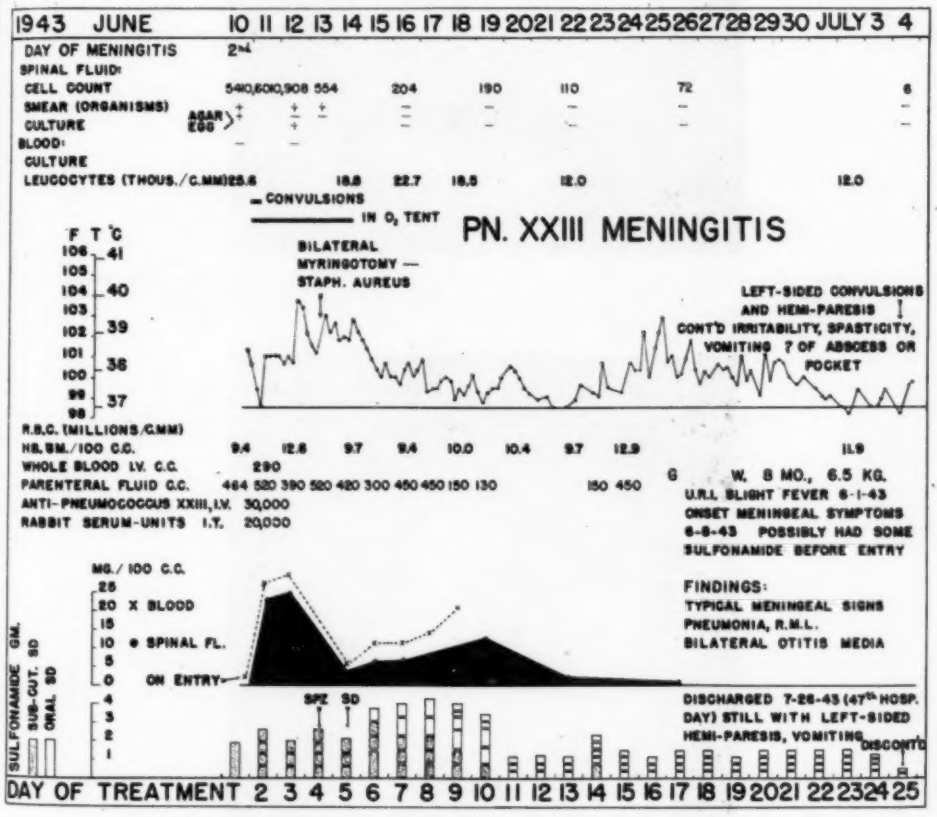

1943 JUNE 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 JULY 3 4
DAY OF MENINGITIS 2nd
SPINAL FLUID:
CELL COUNT 5410 6000 2908 554 204 190 110 72 6
SMEAR (ORGANISMS)
CULTURE
BLOOD:
CULTURE
LEUCOCYTES (THOUS./C.MM) 25.6 18.8 22.7 18.5 12.0 12.0
CONVULSIONS
IN O2 TENT
PN. XXIII MENINGITIS
BILATERAL MYRINGOTOMY — STAPH. AUREUS
LEFT-SIDED CONVULSIONS AND HEMI-PARESIS
CONT'D IRRITABILITY, SPASTICITY, VOMITING ? OF ABSCESS OR POCKET
F T °C
R.B.C. (MILLIONS/C.MM)
HB. GM./100 C.C. 9.4 12.6 9.7 9.4 10.0 10.4 9.7 12.9 11.9
WHOLE BLOOD I.V. C.C. 290
PARENTERAL FLUID C.C. 464 520 390 520 420 300 450 450 150 130 150 450
ANTI-PNEUMOCOCCUS XXIII, I.V. 30,000
RABBIT SERUM-UNITS I.T. 20,000
G. W. 8 MO., 6.5 KG.
U.R.I. SLIGHT FEVER 6-1-43
ONSET MENINGEAL SYMPTOMS 6-8-43 POSSIBLY HAD SOME SULFONAMIDE BEFORE ENTRY
FINDINGS:
TYPICAL MENINGEAL SIGNS
PNEUMONIA, R.M.L.
BILATERAL OTITIS MEDIA
MG./100 C.C.
X BLOOD
• SPINAL FL.
ON ENTRY
SULFONAMIDE GM.
SUB-CUT. SD
ORAL SD
SPZ SD
DISCHARGED 7-26-43 (47th HOSP. DAY) STILL WITH LEFT-SIDED HEMI-PARESIS, VOMITING
DISCONT'D
DAY OF TREATMENT 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Chart 17.

Physical examination on entry revealed him to be very acutely ill with slight convulsive twitchings and irregular respiration characterized by short periods of apnea. In addition, there were signs of a right middle lobe lobar pneumonia. The spinal fluid was cloudy with 5,410 cells and numerous pneumococci typed directly as type XXIII. The infant was placed in an oxygen tent immediately, and treatment was begun with subcutaneous sodium sulfadiazine in 0.5 per cent solution. Additional amounts of parenteral fluids and small whole blood transfusions were also given. On June 11, 30,000 units of type XXIII antipneumococcus serum were given intravenously and 20,000 units intraspinously. Bi-

Fig. 7 (Case 25).—Encephalogram 9-13-43, P-A, asymmetric dilatation of anterior horns (Evans index .33), left more than right, with much increase in subarachnoid space over left cortex; also considerable dilatation of third ventricle.

Fig. 8 (Case 25).—Encephalogram 6-14-44, P-A, still asymmetry of anterior horns (Evans index .227), left larger than right; less subarachnoid air than previously on left.

lateral otitis media present on entry required myringotomy on June 13. From both ears only the *Staphylococcus aureus* was obtained. Sulfadiazine was continued in fairly high dosage until June 19 by both subcutaneous and oral routes of administration. Dosage was reduced on June 20, but chemotherapy was maintained by oral route in an amount approximating 0.2 Gm. per kilogram per twenty-four hours until July 4. At this time, the cell count of the spinal fluid had fallen to 6, but throughout this period there were occasional left-sided convulsions with continued hemiparesis, continued irritability, spasticity, and vomiting. At this time, the question of abscess or of a pocket of pus in the meninges was raised. Although chemotherapy had been discontinued, the patient was observed in the hospital until July 26. Throughout this period, he showed no change in signs or symptoms and was discharged on the forty-seventh hospital day still with a left-sided hemiparesis and occasional vomiting. There had been no positive spinal fluid smears nor cultures since the third hospital day.

The second entry of this infant at the age of 10 months was on August 5, after an interval of one week. Daily vomiting had continued at home, but he seemed otherwise unchanged until August 3, at which time he became irritable and began to have fever. On August 4, he had been seen as an outpatient and started on oral sulfadiazine. However,

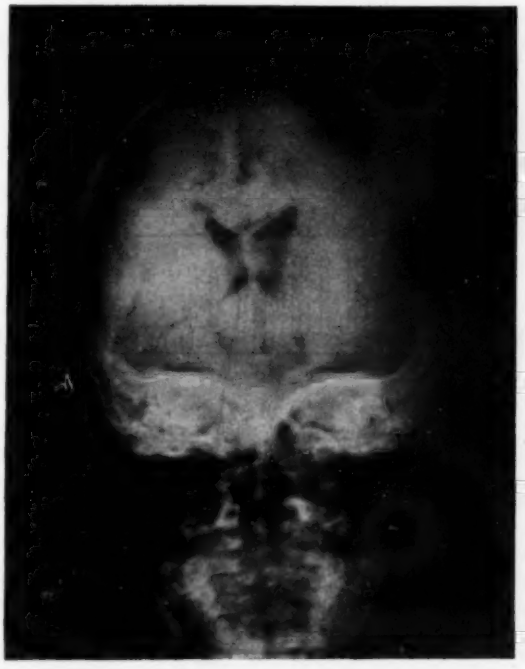


Fig. 9. (Case 25).—Encephalogram 11-24-44, A-P view, showing anterior horns apparently unchanged from 6-16-44; still less subarachnoid air.

at home his mother discovered that he had a stiff neck, and the following day he was brought back to the hospital for admission. At this time he appeared moderately acutely ill with definite meningeal signs and presence still of a left-sided hemiparesis. Lumbar puncture on entry obtained slightly turbid fluid with 650 cells. Organisms were neither seen nor cultured on this examination. On the following day, however, the spinal fluid showed 1,640 cells with diplococci seen on smear and pneumococcus type XXIII obtained on culture on the fertile egg. At no time during this admission were cultures on blood agar positive. Chemotherapy was begun with sodium sulfapyrazine as 0.5 per cent solution subcutaneously. Oral administration was also employed for seven days but was discontinued and the patient maintained on subcutaneous therapy alone because he had been unable to retain the drug given orally. Therapy was discontinued on August 28, but a

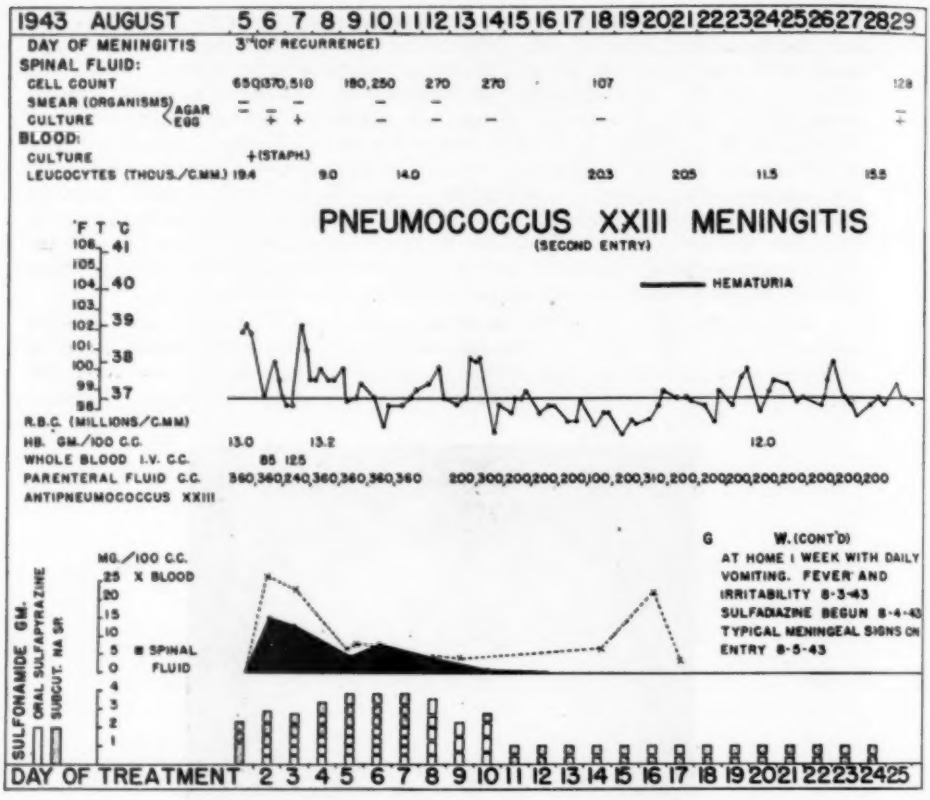

1943 AUGUST 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
DAY OF MENINGITIS 3rd (OF RECURRENCE)
SPINAL FLUID:
CELL COUNT 650 370 510 180 250 270 270 107 128
SMEAR (ORGANISMS) AGAR – – – – – – – –
CULTURE EGG + + – – – – + +
BLOOD:
CULTURE + (STAPH.)
LEUCOCYTES (THOUS./C.MM.) 19.4 9.0 14.0 20.3 20.5 11.5 15.5
PNEUMOCOCCUS XXIII MENINGITIS
(SECOND ENTRY)
HEMATURIA
°F °C
106 41
105
104 40
103
102 39
101
100 38
99
98 37
R.B.C. (MILLIONS/C.MM)
HB. GM./100 C.C. 13.0 13.2 12.0
WHOLE BLOOD I.V. C.C. 85 125
PARENTERAL FLUID C.C. 360 360 240 360 360 360 360 200 300 200 200 200 100 200 310 200 200 200 200 200 200 200
ANTIPNEUMOCOCCUS XXIII
G W. (CONT'D)
AT HOME 1 WEEK WITH DAILY VOMITING. FEVER AND IRRITABILITY 8-3-43
SULFADIAZINE BEGUN 8-4-43
TYPICAL MENINGEAL SIGNS ON ENTRY 8-5-43
SULFONAMIDE GM.
ORAL SULFAPYRAZINE
SUBCUT. NA SR
MG./100 C.C.
25 X BLOOD
20
15
10
5 ■ SPINAL
0 FLUID
4
3
2
1
DAY OF TREATMENT 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Chart 18.

repeat lumbar puncture on August 29 revealed a growth of pneumococcus type XXIII on the fertile egg. Sulfapyrazine administration was resumed on August 31 and continued then until September 14, at which time it was discontinued for good. The temperature throughout this period was relatively normal, but because the patient did not seem to be completely well, on September 2 and September 4 he was given 25,000 units of type XXIII antipneumococcus serum intraspinously.

Psychometric examination done on September 25, 1943, revealed a mental age of 10 months and an I.Q. of 83. Lowest failure was in spontaneous vocalization. The I.Q. of 83 was not considered a reliable index because too many items had to be omitted because of motor retardation. The patient's general response in this test was that of an average child. On discharge on September 28, he appeared to be recovering slightly the use of his left arm and leg. Hospital stay on this second entry was fifty-five days. A pneumoencephalogram done shortly before discharge revealed considerable concentration of air over the left cortex, and the left lateral ventricle was slightly larger than the right (Fig. 7).

The patient was readmitted to the hospital on June 15, 1944, for reappraisal. Since his discharge, he had apparently done very well; appetite was good, and he had gained weight. He used the left arm some and walked a little. He could say single words and appeared to be alert and interested. This was ten months after recovery from meningitis, and the patient was then 21 months old. Left hemiparesis was still present. Psychometric examination revealed a mental age of 17 months and an I.Q. of 81. This was considered consistent with dull normal intelligence and was close to the tentative results obtained previously. Results of pneumo-encephalography were indeterminate because of poor filling. However, air was not seen over the left cortex as in the previous examina-

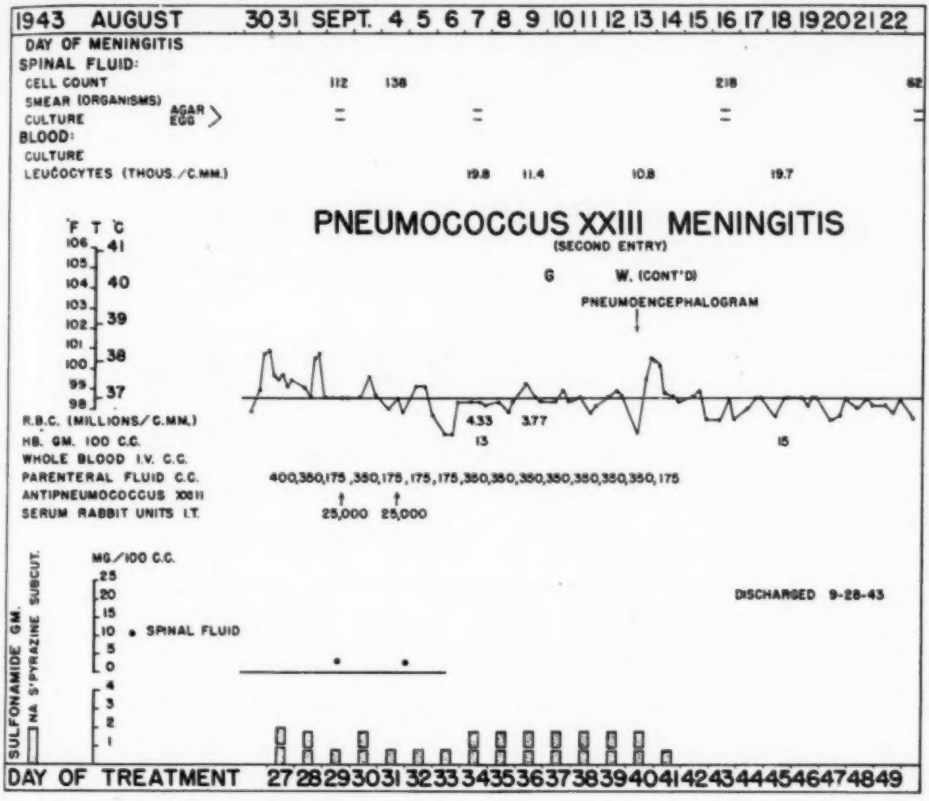


Chart 19.

tion, and the left ventricle did appear to be somewhat smaller (Fig. 8). On November 24, 1944, a similar finding was noted (Fig. 9).

CASE 26 (Table II).—This 3-month-old Negro girl, M. L. H., had developed an upper respiratory infection on April 9, 1943. Several hours before entry on the day of admission, April 13, she began to choke and to have alternately rapid and slow breathing with cessation of respiration on one or two occasions. She was very fretful throughout the day and refused food.

On admission she seemed very acutely ill, and the physical findings were those of a severe bronchiolitis with a frequent cough and inspiratory retraction of the intercostal spaces. There were many fine râles throughout the lung fields. Temperature was 35° C. rectally. There were no signs of meningeal irritation. Thick tenacious mucus filled the posterior pharynx. There was no sign of otitis media. Two subcutaneous doses of 0.5 per cent sodium sulfapyrazine were given, and the child was kept in an oxygen tent continuously. The periods of apnea continued to recur, and she expired seventeen hours after entry.

A post-mortem lumbar puncture obtained bloody spinal fluid, the culture of which revealed a good growth of pneumococcus type XIV. Post-mortem blood culture, however, showed no growth. At autopsy there was bronchopneumonia of all lobes of the lungs confluent in the upper and lower lobes of the right lung and a fibrinopurulent fluid in the pleural cavity on the right side. Culture of the pleural fluid obtained a good growth of pneumococcus type XIV. Post-mortem examination of the brain showed it to be grossly normal. Unfortunately, no sections were taken for microscopic study, and no temporal bone studies were made. A terminal invasion of the spinal fluid without time for meningeal reaction had apparently occurred.

TABLE III

Date of Admission	Case No.	History No.	Race	Sex	Age—Yr.	Body Wt. Kg.	Apparent Portal of Entry	Apparent Day of Meningitis When Treatment Was Started	Sulfonamide Therapy					Penicillin Therapy				
									Total		Gm. Before First Neg. Sp. Fl. Culture and Permanent Sterilization	Concentration Range in Mg. per 100 c. c.		Total		Units Before First Neg. Sp. Fl. Culture and Permanent Sterilization	Concentration Range in Mg. per 100 c. c.	
									Gm.	Days Administered		Blood	Sp. Fl.	Units	Days Administered		Blood	Sp. Fl.
11-11-43	J. R. 27	T-2703	W	M	8/12	9.0	U.R.T	7th?	SC 12.1 SPZ O 14.4 SD	15	Not until penicillin begun	14.0-54.0	40.0 (one det.)	IC 15,000 IVent 20,000 IM 350,000 IV 10,000	6	IC 10,000 IM 80,000 IV 10,000	—	—
12- 4-43	D. J. 28	T-2938	W	M	7/12	7.2	T.B.?	10th	O 3.125 SM SC 35.05 SD	18	SC 29.0 SD SD 1.2 SPZ + Pen.	8.2-23.2	3.1-34.2	IC 10,000 IS 60,000 SC 47,000	4	IC 10,000 IS 25,000 SC 47,000	—	—
1- 2-44	V. S. 29	U-151	W	F	4/12	6.0	U.R.T.	5th	—	—	—	—	—	IS 160,000 IM 1,190,000	20	IS 10,000 IM 10,000	0.2-2.0	0.2-0.4
2-11-44	J.P.L. 30	* U-315	W	M	4/12	6.0	U.R.T.	3rd	O 43.1 SD SC 4.4 SD Na	18	SC 3.0 SD + Pen.	8.3-21.8	5.1	IC 10,000 IS 300,000 IM 1,185,000	17	IC 10,000 IS 20,000 IM 120,000	0.1-1.0	0.2-1.0
3-15-44	J. H. 31	U-558	W	M	6 wk.	4.1	U.R.T.	7th	SC 0.3 SD Na	7/24	—	—	—	IC 10,000 IS 20,000 IM 20,000	7/24	—	—	—
4-16-44	O. O. 32	U-735	C	M	16/12	10.0	T.B.?	4th?	O 77.7 SD SC 20.8 SD Na	32	SC 5.5 SD Na + Pen.	1.1-59.6	27.2	IS 230,000 IM 1,440,000	24	IS 30,000 IM 120,000	0.1-1.0	0.1-0.4
4-28-44	J. M. 33	U-817	W	M	14/12	8.8	Blood stream	4th	O 16.0 SM SC 69.8 SM Na	22	SC 1.8 SM Na + Pen.	3.2-37.6	15.9	IS 345,000 IM 1,675,000	32	IS 20,000 IM 65,000	0.1-0.4	0.1-0.4
5- 8-44	R. F. 34	U-862	W	M	2-1/2	?	U.R.T.	5th	SC 3.0 SD Na	6/24	—	86.9	79.5	IS 20,000 IM 40,000	6/24	—	0.4-1.0	0.4-1.0

TABLE III—Continued

Case No.	Other Therapy: Serum: Route	Other Therapy: Serum: Total Dosage	Other Therapy: Serum: Day of Meningitis Administered	Other Therapy: Mastoidectomy: Side	Other Therapy: Mastoidectomy: Day of Treatment with Sulfonamide	Bacteriological Data: Blood Culture: No. Taken	Blood Culture: No. Pos.	Blood Culture: No. Neg.	Blood Culture: Day of Treatment when Last Positive	Spinal Fluid: Smear: 1st	Smear: Type	Smear: Day of Treatment when Last Positive	Spinal Fluid: Culture: 1st	Culture: Type	Culture: Day of Treatment when Last Positive	Complicating Infections	Days of Hospital Stay	Outcome
J. R. 27	IS IVent IV	25,000 U 25,000 U 50,000 U	9th	—	—	3	0	3	—	+	Not until culture	11th	+	I	11th	None	22	D
D. J. 28	—	—	—	—	—	0	0	0	—	0	Not until culture	—	+	II	6th	Bilateral acute otitis media	28	D
V. S. 29	—	—	—	—	—	1	0	1	—	+	I	3rd	+	I	1st	Bilateral otitis media	35	R
J. P. L. 30	—	—	—	—	—	1	0	1	—	+	I	1st	+	I	2nd	Bilateral otitis media	30	R
J. H. 31	IV	5,000 U	7th	—	—	1	0	1	—	+	V	—	+	V	—	None	7/24	D
O. O. 32	IS IM	25,000 U 50,000 U	5th	Right Left	10	4	1	3	1st	+	IV	4th	+	IV	1st	Bilateral acute otitis media, bilateral mastoiditis	37	R
J. M. 33	IS IC IM	25,000 U 25,000 U 50,000 U	4th 5th 4th	Right Left	9	2	1	1	1st	+	XXIII	1st	+	XXIII	1st	Bilateral acute otitis media and mastoiditis	42	R
R. F. 34	IS IM	25,000 U 50,000 U	5th 5th	—	—	1	0	1	—	+	XIV	—	+	XIV	—	None	6/24	D

U.R.T., Upper respiratory tract. T.B., Temporal bone. O, Orally. SC, Subcutaneously. IC, Intracisternally. IM, Intramuscularly. IS, Intraspinously. IV, Intravenously. IVent, Intraventricularly. Na, Sodium salt. SM, Sulfamerazine. SD, Sulfadiazine. SPZ, Sulfapyrazine. R, Recovered. D, Died.

PROTOCOLS OF PENICILLIN TREATED CASES

CASE 27 (Table III).—This 8-month-old infant, J. R., was said to have had a lobar pneumonia with onset on October 16, 1943, treated by a local physician with liquid medicine. He apparently improved but shortly after this began to have an intermittent fever, to vomit, and to have irritability and anorexia. These symptoms became more pronounced, and three days before entry he developed rigidity, strabismus, and a very high fever. Shortly before entry there were intermittent twitchings of all extremities.

Physical examination on entry, on November 11, revealed him stuporous, having continuous slight convulsive twitchings of arms and legs, a bulging anterior fontanelle, and intermittent strabismus. A lumbar puncture on admission obtained turbid spinal fluid with a cell count of 990. A few gram-positive diplococci were seen on stained smear. These were not grown on blood agar, but on the fertile egg membrane there was growth of a type I pneumococcus. White blood cell count was 47,000 with a marked shift to the left. Blood culture showed no growth. Treatment was begun with sodium sulfapyrazine in 0.5 per cent solution administered subcutaneously. In addition he was given 50,000 units of type I antipneumococcus serum intraspinously and another 50,000 units intravenously. Supportive measures included adequate parenteral fluids and a small whole blood transfusion. Therapy produced no clinical improvement, the patient's convulsions becoming more frequent and vomiting and stupor persisting. Spinal fluid became clear but with always some pleocytosis, and cultures on the fertile egg membrane were still positive after sulfonamide treatment of eleven days although the organism was not recovered on blood agar at any time. That the virulence of these organisms was considerably changed is illustrated by the fact that after injections into the peritoneal cavities of two mice, death was delayed for four days in both instances.

On November 26, penicillin was obtained for use in this case. Five thousand units were given intraspinously, following which 10,000 units were given intramuscularly every three hours. Intraspinal and intramuscular injections were then continued for several days. All subsequent spinal fluid cultures following the institution of this therapy showed no growth. The clinical course of the patient became steadily worse with constant convulsions and a terminal attitude of decerebrate rigidity. Death occurred on December 3.

At autopsy, performed by Dr. Jean Dehlinger of the Department of Pathology, there were found flattening of the sulci and gyri of the cerebral hemispheres, marked dilatation of the blood vessels of the brain, and marked softening of the brain substance in the left parietal lobe. There was advanced dilatation of all four ventricles of the brain, and an acute ependymitis was present. There was clotted blood in the posterior horn of the left lateral ventricle. Microscopic section revealed complete loss of normal architecture for 1 cm. below the brain surface, this being replaced by necrotic material and a dense accumulation of macrophages with a few giant cells.

CASE 28 (Table III).—This 7-month-old infant, D. J., had had an upper respiratory infection two weeks previous to hospital entry, followed in four days by spontaneous rupture of the right eardrum. On the following day there was onset of generalized convulsions, and he was hospitalized elsewhere and given some sulfonamide drug in suspension in liquid form. The day following, a lumbar puncture is said to have obtained spinal fluid which showed pneumococci. At this time the patient was given some antipneumococcus serum and placed on sulfadiazine, 0.5 Gm. every three hours. There was no improvement in his condition, and on December 4, 1943, he was transferred to this hospital, entering on the tenth day of his meningitis.

He was found to be very acutely ill, stuporous, and with spastic extremities. The head was hydrocephalic, and the anterior fontanelle was bulging. There was a right suppurative otitis media. A lumbar puncture obtained spinal fluid clear in appearance, with no organisms visible on smear, but with a cell count of 350. Pneumococcus type II was cultured from this spinal fluid. Treatment was begun immediately with large doses of sodium sulfadiazine. A right myringotomy was done which obtained pus from which pneumococcus type II was also grown. There was slight clinical improvement, but spinal fluid cultures taken subsequently continued to be positive until December 8. On this date penicillin treatment was begun with intraspinal injections of 5,000 units followed by 5,000

units given subcutaneously every four hours, and penicillin was continued until December 13; sulfonamide chemotherapy was continued as before. Spinal fluid cultures following institution of penicillin therapy were then sterile with a cell count of less than a hundred until December 10, at which time there was slight growth. Following this, there were no further positive spinal fluid cultures.

Infection in the right ear continued with very little change and intermittent drainage followed repeated myringotomies. On December 18, the left ear was also found to be infected with a bulging membrane. Incision drained mucopurulent material from which a pneumococcus was obtained on egg culture. The child remained very much the same throughout this period. On December 27, a pneumo-encephalogram revealed hydrocephalus with marked dilatation of both lateral and third and fourth ventricles (Fig. 10). No air reached the subarachnoid space. The patient continued to show very little change in his clinical condition and died on December 31.

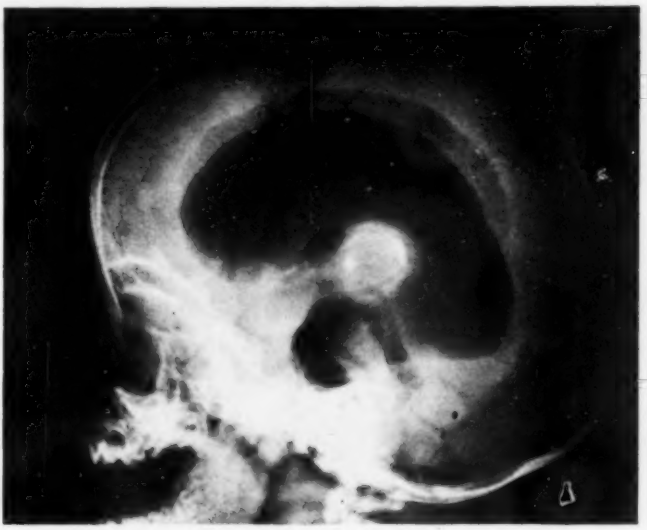


Fig. 10 (Case 28).—Encephalogram, left lateral, showing extreme dilatation of whole ventricular system.

At autopsy, performed by Dr. Leidler of the Department of Pathology, there was abundance of white exudate over the cortex in the subarachnoid space. There was slight dilatation of the lateral ventricles and a mild ependymitis. Microscopic section revealed increase in fibrous tissue of the meninges and necrosis in an area of the cortex. No temporal bone studies were made.

Case 29 (Chart 20 and Table III).—This 4-month-old child, V. S., had had onset of a mild upper respiratory infection about one month previously but seemed fairly well until the onset of meningeal symptoms five days previous to hospital entry when fever, stiff neck, and loss of appetite occurred. These symptoms grew steadily worse until shortly before entry on January 12, 1944, at which time she had a generalized convulsion and was brought to the hospital. She was found very acutely ill with Biot breathing, signs of meningeal irritation, and a bilateral otitis media. A lumbar puncture on admission obtained slightly turbid spinal fluid with a count of 1,210 cells and a large number of gram-positive diplococci which proved to be pneumococcus type I on direct typing. White blood count was 20,300 with a moderate left shift. Blood culture was negative as was material obtained on bilateral myringotomy except that *Staphylococcus aureus* was obtained from the left ear.

Penicillin therapy alone was employed, 10,000 units being given intrathecally daily for fourteen days. Intramuscular penicillin was given, 10,000 units every three hours.

Fig. 11 (Case 29).—Smear of original spinal fluid, teeming with organisms and containing few leucocytes.

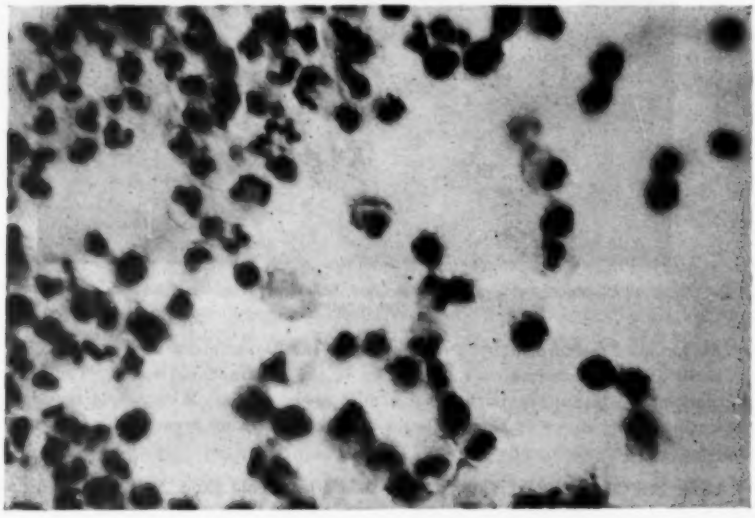


Fig. 12 (Case 29).—Smear after less than twenty-four hours of penicillin therapy, showing almost complete disappearance of organisms and a considerable increase in leucocytes.

After the first spinal fluid examination showing pneumococcus type I, on all subsequent examinations no organisms were either seen or grown on either agar or fertile egg membrane. The striking effect of penicillin on the number of organisms is well shown in Figs. 11 and 12. Blood levels of penicillin ranged between 0.2 and 1 unit per cubic centimeter. Spinal fluid cell count dropped slowly; clinical improvement was slow. Both ears continued to drain throughout this period. She continued to vomit intermittently and to have stiffness of the neck, ptosis of the left eyelid, and rotation of the head to the left. There was a slight right-sided hemiparesis. Penicillin therapy was discontinued entirely on February 1. Cell count of the spinal fluid at this time dropped to 4. A pneumo-encephalogram was performed on February 10, revealing an internal hydrocephalus with suggestion of obstruction of the subarachnoid space (Fig. 13).

Fig. 13 (Case 29).—Encephalogram, left lateral, showing marked dilatation of lateral ventricles.

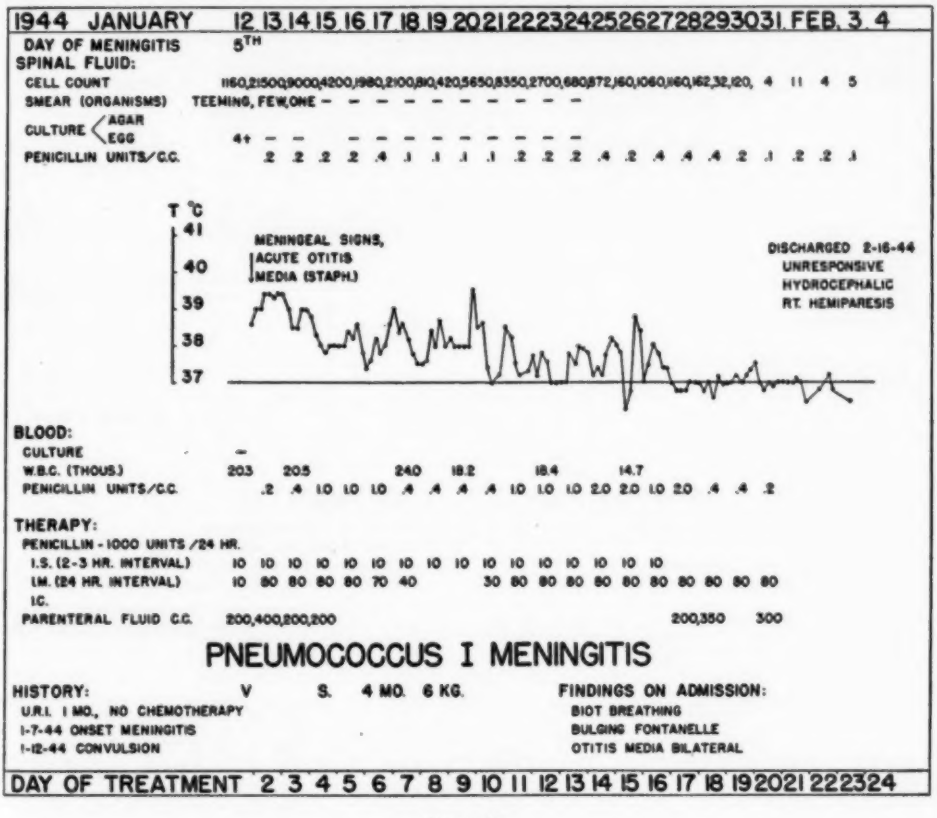

1944 JANUARY 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 FEB. 3 4
DAY OF MENINGITIS 5TH
SPINAL FLUID:
CELL COUNT 1160,2150,9000,4200,1980,2100,810,420,5650,8350,2700,680,872,160,1060,1160,162,32,120, 4 11 4 5
SMEAR (ORGANISMS) TEEMING, FEW, ONE – – – – – – – – – – –
CULTURE AGAR 4+ – – – – – – – – – – –
CULTURE EGG
PENICILLIN UNITS/C.C. .2 .2 .2 .2 .4 .1 .1 .1 .1 .2 .2 .2 .4 .2 .4 .4 .4 .2 .1 .2 .2 .1
T °C
41
40
39
38
37
MENINGEAL SIGNS,
ACUTE OTITIS
MEDIA (STAPH.)
DISCHARGED 2-16-44
UNRESPONSIVE
HYDROCEPHALIC
RT. HEMIPARESIS
BLOOD:
CULTURE –
W.B.C. (THOUS.) 20.3 20.5 24.0 18.2 18.4 14.7
PENICILLIN UNITS/C.C. .2 .4 1.0 1.0 1.0 .4 .4 .4 .4 1.0 1.0 1.0 2.0 2.0 1.0 2.0 .4 .4 .2
THERAPY:
PENICILLIN - 1000 UNITS /24 HR.
I.S. (2-3 HR. INTERVAL) 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
I.M. (24 HR. INTERVAL) 10 80 80 80 80 70 40 30 80 80 80 80 80 80 80 80 80 80
I.C.
PARENTERAL FLUID C.C. 200,400,200,200 200,350 300
PNEUMOCOCCUS I MENINGITIS
HISTORY: V S. 4 MO. 6 KG.
U.R.I. 1 MO., NO CHEMOTHERAPY
1-7-44 ONSET MENINGITIS
1-12-44 CONVULSION
FINDINGS ON ADMISSION:
BIOT BREATHING
BULGING FONTANELLE
OTITIS MEDIA BILATERAL
DAY OF TREATMENT 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Chart 20.

CASE 30 (Chart 21 and Table III).—This 4-month-old infant, J. L., was recovering from an upper respiratory infection which had begun two weeks before entry to the hospital. On February 10, 1944, there was onset of signs of meningitis with convulsions, vomiting, and slight fever. Convulsions recurred several times, and he was brought to the hospital.

Physical examination on entry showed him to be an acutely ill infant with convulsive movements of the right arm and right side of the face, deeply comatose, with widely dilated pupils, and a bulging fontanelle. There were intermittent periods of cyanosis requiring oxygen therapy. A lumbar puncture obtained slightly cloudy spinal fluid from which type I pneumococcus was identified directly. The child was immediately placed in an oxygen tent; 10,000 units of penicillin were given intraspinously, 20,000 units intramuscularly, and then 10,000 units intracisternally. He was also given intravenous dextrose and subcutaneous sulfonamide chemotherapy as sodium sulfadiazine, 0.2 Gm. per kilogram of body weight, in fortified lactate-Ringer's solution. Penicillin and sulfadiazine therapy was continued with additional supportive parenteral fluid therapy. Cyanosis improved, but right-sided convulsions recurred and continued intermittently with right hemiparesis and spasticity, the latter signs persisting until the time of discharge. A slight alkalosis

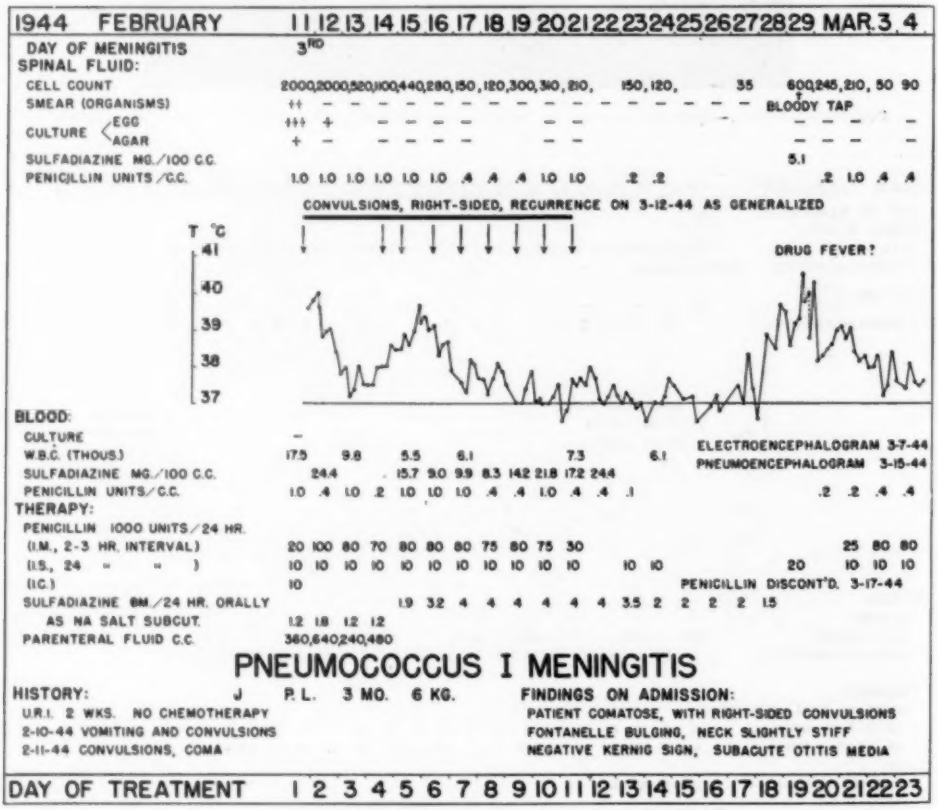

1944 FEBRUARY 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 MAR 3 4
DAY OF MENINGITIS 3RD
SPINAL FLUID:
CELL COUNT 2000,2000,520,100,440,280,150,120,300,30,210, 150,120, 35 600,245,210, 50 90
SMEAR (ORGANISMS) BLOODY TAP
CULTURE EGG AGAR
SULFADIAZINE MG./100 C.C. 5.1
PENICILLIN UNITS/C.C. 1.0 1.0 1.0 1.0 1.0 1.0 .4 .4 .4 1.0 1.0 .2 .2 .2 1.0 .4 .4
CONVULSIONS, RIGHT-SIDED, RECURRENCE ON 3-12-44 AS GENERALIZED
T °C
41
40
39
38
37
DRUG FEVER?
BLOOD:
CULTURE
W.B.C. (THOUS.) 17.5 9.8 5.5 6.1 7.3 6.1
SULFADIAZINE MG./100 C.C. 24.4 15.7 9.0 9.9 8.3 14.2 21.8 17.2 24.4
PENICILLIN UNITS/C.C. 1.0 .4 1.0 .2 1.0 1.0 1.0 .4 .4 1.0 .4 .4 .1 .2 .2 .4 .4
ELECTROENCEPHALOGRAM 3-7-44
PNEUMOENCEPHALOGRAM 3-15-44
THERAPY:
PENICILLIN 1000 UNITS/24 HR.
(I.M., 2-3 HR. INTERVAL) 20 100 80 70 80 80 80 75 80 75 30 25 80 80
(I.S., 24 " ") 10 10 10 10 10 10 10 10 10 10 10 10 20 10 10 10
(I.C.) 10
PENICILLIN DISCONT'D. 3-17-44
SULFADIAZINE GM./24 HR. ORALLY 1.9 3.2 4 4 4 4 4 4 3.5 2 2 2 2 1.5
AS NA SALT SUBCUT. 1.2 1.8 1.2 1.2
PARENTERAL FLUID C.C. 360,640,240,480
PNEUMOCOCCUS I MENINGITIS
HISTORY: J P. L. 3 MO. 6 KG.
U.R.I. 2 WKS. NO CHEMOTHERAPY
2-10-44 VOMITING AND CONVULSIONS
2-11-44 CONVULSIONS, COMA
FINDINGS ON ADMISSION:
PATIENT COMATOSE, WITH RIGHT-SIDED CONVULSIONS
FONTANELLE BULGING, NECK SLIGHTLY STIFF
NEGATIVE KERNIG SIGN, SUBACUTE OTITIS MEDIA
DAY OF TREATMENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Chart 21.

with tetany detected on February 15, with a serum CO_2 content of 77 volumes per cent, was corrected by administration of CO_2 inhalations and reduction in the amount of potential alkali which was being administered. Because of marked improvement, penicillin therapy was discontinued on February 25. On February 27, there was again elevation of temperature. The eardrums had been slightly reddened and dull and full on February 13, and on February 29, a right myringotomy was performed without obtaining pus. Penicillin therapy was resumed and continued then until March 7, intraspinously and intramuscu-

larly. Intrathecal injections alone were then continued for ten more days. Blood and spinal fluid levels were also obtained throughout this period. On March 15, a pneumoencephalogram (Fig. 14) showed asymmetrical dilatation of the ventricular system.

He was seen again on June 6, at the age of 7 months, when it was learned that for the previous month both ears had been draining. Both physical and mental development seemed normal. Adenoidectomy was performed.

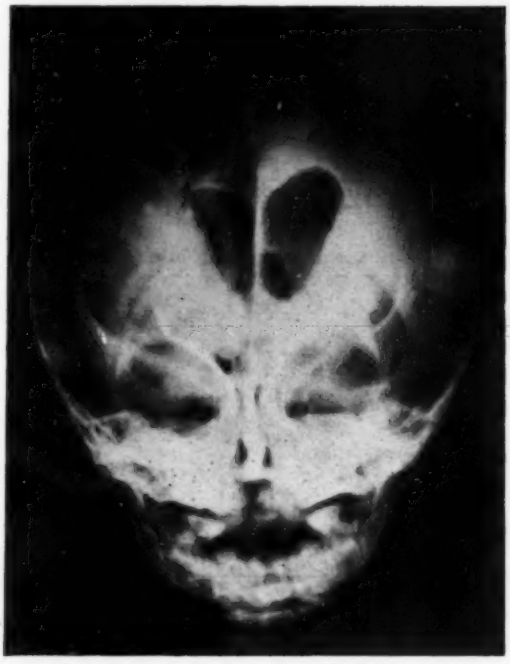


Fig. 14 (Case 30).—Encephalogram, P-A view, showing marked dilatation of anterior horns (Evans index .358), left more than right; also dilatation of third ventricle.

CASE 31 (Table III).—This 6-week-old boy, J. H., had had a mild upper respiratory infection with nasal discharge for about a month. Seven days prior to hospital entry, the baby began to show signs of fever, anorexia, listlessness, and drowsiness. This was followed shortly by convulsions and stiffness of the neck and back. This child's illness continued for several days with no chemotherapy being given. Five days before entry he was taken to a local hospital where he was treated with fluids alone. Frequency and severity of convulsions increased, and the child showed no response to stimuli.

He was admitted to this hospital on March 17, 1944, at which time he was moribund. The fontanelle was slightly full and the neck not noticeably stiff, although the back was slightly stiff. There was evident peripheral vascular collapse, and the child was in continuous convulsions. A lumbar puncture obtained cloudy spinal fluid with a cell count of 540 and numerous gram-positive diplococci which were found by direct typing to be type V pneumococcus. The child was placed in an oxygen tent immediately, given dextrose intravenously and 20,000 units of penicillin intramuscularly. Fifteen minutes later 20,000 units were injected intraspinally into the lumbar region, and in another fifteen minutes 10,000 units into the cistern. Sixty cubic centimeters per kilogram (or 0.3 Gm. per kilogram) of sodium sulfadiazine in 0.5 per cent solution were given subcutaneously. Six hours after admission 50,000 units of type specific type V antipneumococcus serum were injected intravenously. Shortly after the completion of these measures th' ' expired.

Autopsy was noncontributory except for confirmation of generalize leptomeningitis due to type V pneumococcus.

CASE 32 (Chart 22 and Table III).—This 16-month-old infant, O. O., had had onset of an upper respiratory infection with a cough, running nose, and conjunctivitis on April

9, 1944, six days previous to his hospital entry. Three days later there was onset of meningeal symptoms with fever, anorexia, listlessness, and vomiting. The patient was seen elsewhere and referred to the St. Louis Isolation Hospital as a case of meningitis. There, a lumbar puncture revealed pneumococci, and after giving the child 100 c.c. of 0.5 per cent sodium sulfadiazine, he was transferred to this hospital.

Physical examination on entry revealed him to be moderately acutely ill with signs of meningitis and a bilateral otitis media with perforation of the left eardrum and pus in the canal. A lumbar puncture obtained cloudy greenish fluid with a cell count of 1,000 and numerous organisms identified directly as type IV pneumococcus. A blood culture taken at this time showed growth of the same organism. There was a leucocyte count of 17,000 with a marked left shift.

Intensive therapy was begun with an immediate dose of 20,000 units of penicillin given intramuscularly and 20,000 units of penicillin given intraspinously. He was given supportive

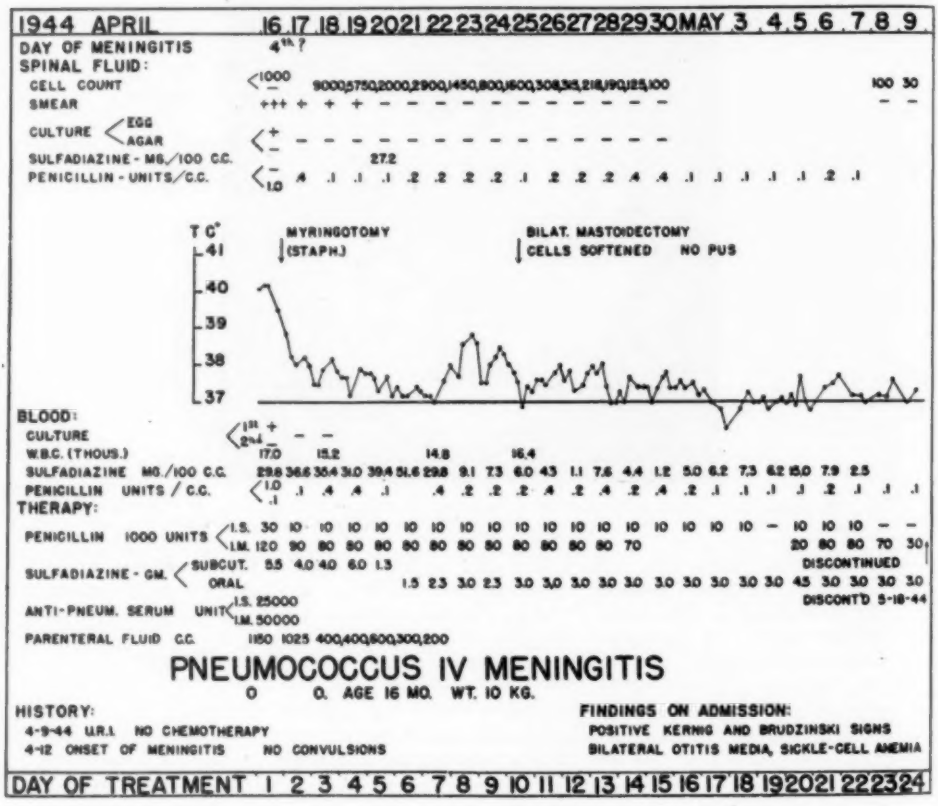

1944 APRIL 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 MAY 3 4 5 6 7 8 9
DAY OF MENINGITIS 4th ?
SPINAL FLUID:
CELL COUNT
SMEAR
CULTURE EGG AGAR
SULFADIAZINE - MG./100 C.C.
PENICILLIN - UNITS/C.C.
T C°
41
40
39
38
37
MYRINGOTOMY (STAPH.)
BILAT. MASTOIDECTOMY CELLS SOFTENED NO PUS
BLOOD:
CULTURE
W.B.C. (THOUS.)
SULFADIAZINE MG./100 C.C.
PENICILLIN UNITS / C.C.
THERAPY:
PENICILLIN 1000 UNITS I.S. I.M.
SULFADIAZINE - GM. SUBCUT. ORAL
DISCONTINUED
ANTI-PNEUM. SERUM UNIT I.S. I.M.
DISCONT'D 5-18-44
PARENTERAL FLUID C.C.
PNEUMOCOCCUS IV MENINGITIS
O O. AGE 16 MO. WT. 10 KG.
HISTORY:
4-9-44 U.R.I. NO CHEMOTHERAPY
4-12 ONSET OF MENINGITIS NO CONVULSIONS
FINDINGS ON ADMISSION:
POSITIVE KERNIG AND BRUDZINSKI SIGNS
BILATERAL OTITIS MEDIA, SICKLE-CELL ANEMIA
DAY OF TREATMENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Chart 22.

fluid therapy both intravenously and subcutaneously, the latter containing 1.5 Gm. sodium sulfadiazine. Fifty thousand units of type IV antipneumococcus serum were given intramuscularly and later 25,000 units intraspinously. All of this was accomplished in the first four hours of hospital stay. He was then maintained on parenterally administered sodium sulfadiazine subcutaneously in amounts approximating 0.6 Gm. per kilogram body weight per twenty-four-hour period. Maintenance dose of penicillin was 10,000 units intramuscularly every three hours and 10,000 units intraspinously given daily. Blood levels of sodium sulfadiazine ranged as high as 51 mg. per 100 c.c., and penicillin blood levels ranged between 0.1 and 0.2 unit per cubic centimeter.

A myringotomy of the right eardrum obtained pus from which only staphylococci were grown. Steady clinical improvement followed institution of these measures of therapy. No

further positive cultures were obtained on the spinal fluid, although by stained smear organisms could be seen for the first four days. There was an early rise in the cell count of the spinal fluid to 9,000 which then fell steadily, although not entirely to normal, as 80 cells were present in the spinal fluid when penicillin was discontinued on the twenty-fourth day of treatment. There was no improvement of the otitis media; drainage of thick, stringy, purulent material continued. Accordingly, on April 25, a bilateral simple mastoidectomy was performed with identical findings on both sides. These consisted of softened mastoid cells extending back to the sinodural angle and into the zygomatic root. The antra were filled with thickened pyogenic membrane and granulation tissue. Very little actual pus was obtained. The ears continued to drain in spite of excellent clinical condition otherwise, and to relieve this condition, on May 11, 1944, a simple adenoidectomy was done following which there was rather prompt resolution of the otitis media.

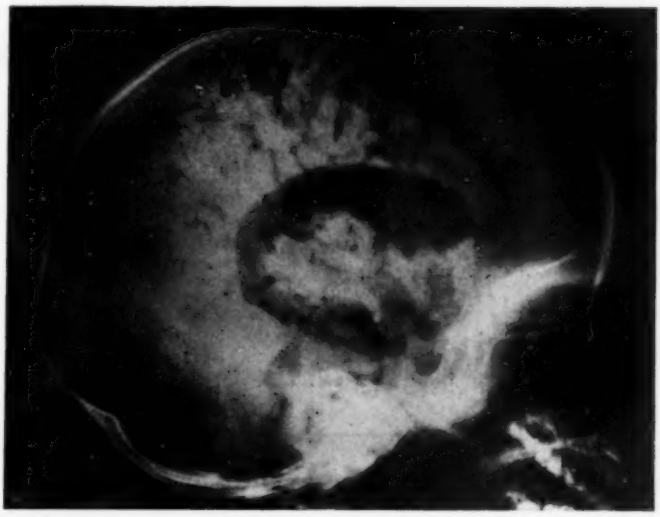


Fig. 15 (Case 32). Encephalogram, left lateral, showing moderate dilatation of entire ventricular system, some increase in subarachnoid space which in other views is seen to be bilateral, more anterior than posterior.

A pneumo-encephalogram on May 18 revealed no abnormality of the ventricular system (Fig. 15). The child was discharged on May 23 with bilateral total deafness as a residual. An incidental finding in this case was the presence of a sickle-cell anemia for which numerous transfusions had been necessary.

CASE 33 (Chart 23 and Table III).—This 14-month-old infant, J. M., had onset of signs of meningitis on April 25, 1944; he became listless, began to vomit, and to have fever. These signs persisted for four days with no chemotherapy being given. He was then taken to the St. Louis Isolation Hospital where a lumbar puncture revealed cloudy spinal fluid teeming with organisms which appeared to be pneumococci. He was there given 0.2 Gm. per kilogram body weight of sodium sulfamerazine in 0.5 per cent solution and was transferred to this hospital.

Physical examination on entry revealed a critically ill infant with signs of meningitis and bilateral otitis media. A lumbar puncture obtained turbid spinal fluid with a cell count of 880 and many gram-positive diplococci which proved to be pneumococcus type XXIII. This organism was also obtained on blood culture. White blood count at this time was 7,950 with a marked left shift and much toxic granulation. We decided to treat this child intensively using all available methods of therapy. With this in mind, he was given 20,000 units of penicillin intraspinously and 20,000 units intramuscularly, followed by 10,000 units intramuscularly every two hours. Sulfonamide chemotherapy was maintained at a level of about 0.5 Gm. per kilogram body weight administered parenterally as subcutaneous 0.5 per cent solution. Shortly after entry, 50,000 units of type XXIII antipneumococcus serum were injected intramuscularly and 25,000 units intraspinously, the latter being repeated the following day. He was maintained on daily intrathecal injections of

penicillin until May 19, the twenty-second day of the meningitis. A right myringotomy performed on the day of entry obtained pus from which there was growth of a pneumococcus. Since bilateral otitis media continued necessitating repeated bilateral myringotomies, on May 6 a bilateral simple mastoidectomy and adenoidectomy were performed. Throughout this period he was maintained on penicillin injections and subcutaneous sodium sulfamerazine. At operation, bilateral softening of the mastoid process with granulation tissue was found. No gross portal of entry into the meninges was identified. Clinical improvement was slow throughout this period with only a gradual drop in cell count of the spinal fluid, which did not fall below 1,000 cells until the fourth day of treatment. At no time after the initial spinal fluid examination was made, however, were there any positive spinal fluid smears or cultures. Penicillin therapy, which had been stopped on May 19, was resumed on May 24 and carried out for ten days longer. The patient was discharged greatly improved on June 9.

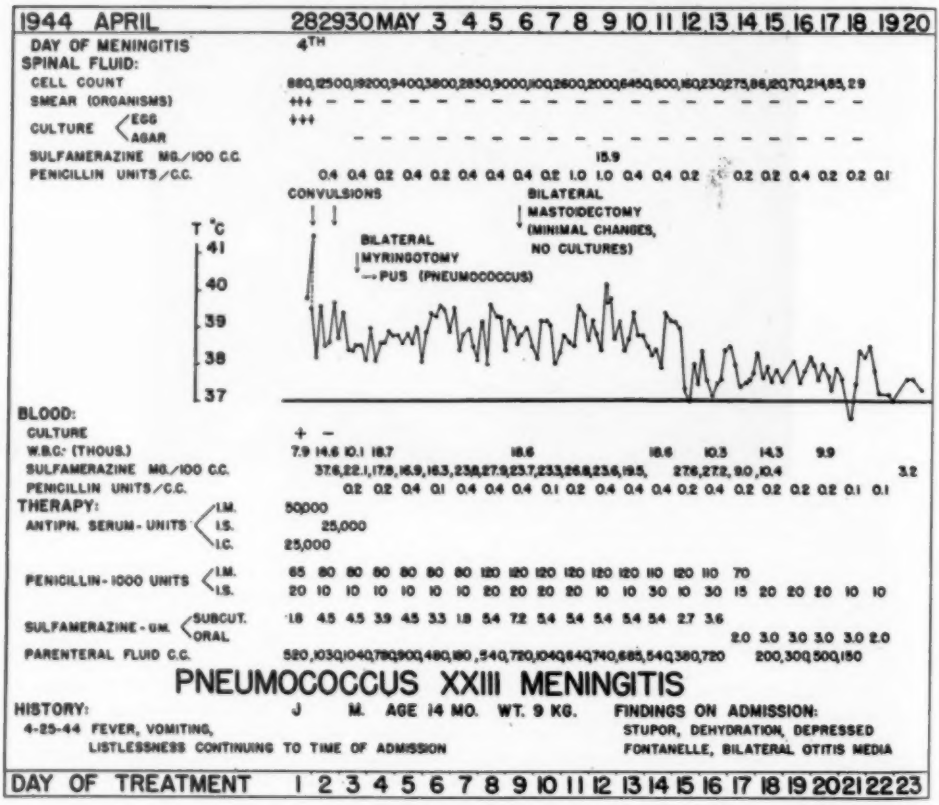

1944 APRIL 28 29 30 MAY 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
DAY OF MENINGITIS 4TH
SPINAL FLUID:
CELL COUNT
SMEAR (ORGANISMS)
CULTURE EGG AGAR
SULFAMERAZINE MG./100 C.C.
PENICILLIN UNITS/C.C.
CONVULSIONS
BILATERAL MYRINGOTOMY → PUS (PNEUMOCOCCUS)
BILATERAL MASTOIDECTOMY (MINIMAL CHANGES, NO CULTURES)
T °C
41
40
39
38
37
BLOOD:
CULTURE
W.B.C: (THOUS.)
SULFAMERAZINE MG./100 C.C.
PENICILLIN UNITS/C.C.
THERAPY:
ANTIPN. SERUM - UNITS I.M. I.S. I.C.
PENICILLIN - 1000 UNITS I.M. I.S.
SULFAMERAZINE - GM. SUBCUT. ORAL
PARENTERAL FLUID C.C.
PNEUMOCOCCUS XXIII MENINGITIS
HISTORY:
J M. AGE 14 MO. WT. 9 KG.
4-25-44 FEVER, VOMITING, LISTLESSNESS CONTINUING TO TIME OF ADMISSION
FINDINGS ON ADMISSION:
STUPOR, DEHYDRATION, DEPRESSED FONTANELLE, BILATERAL OTITIS MEDIA
DAY OF TREATMENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Chart 23.

CASE 34 (Table III).—This 2½-year-old boy, R. F., had had onset of upper respiratory infection on May 1, 1944. Two days later he began to vomit. Stupor and delirium followed the next day. He was seen at a hospital where a lumbar puncture revealed cloudy fluid, and the patient was then sent to St. Louis Isolation Hospital. There he was seen to be very acutely ill. Pneumococcus type XIV was obtained from the spinal fluid. The child showed no improvement on intensive sulfonamide chemotherapy and was sent to this hospital for institution of penicillin therapy. The temperature during this period had ranged between 105° F. and 107° F.; he was comatose and had continuous convulsions.

On entry to this hospital, the child was moribund. Intensive measures were immediately undertaken, consisting of placement in an oxygen tent, intraspinal penicillin 10,000 units, and intraspinal type XIV antipneumococcus serum 25,000 uits. An additional

50,000 units of antipneumococcus serum were given intramuscularly and 0.2 Gm. sodium sulfadiazine in 0.5 per cent solution subcutaneously. Ten thousand units of penicillin were given twice intramuscularly. Despite all therapeutic measures the child expired some seven hours after hospital entry. Permission for autopsy was not obtained.

DISCUSSION

Etiology.—In this relatively small series it may be seen that there is no very great preponderance of any one type of pneumococcus; some types appear with slightly greater frequency than others while many types are not represented at all (see Table IV). Leading the list is the type I pneumococcus with six cases, and next in order are types III and XIV with five cases for each. There were four cases of type V and three of type XVIII, two cases each of types IV, VI, and XXIII, and one each of types II, VII, X, XII, and XIX. Two of the six type I cases were seen in 1939 and two in 1944. Three of the five type III infections were seen in 1937 and three of the five type XIV cases in 1943. In correlating the type with mortality, among those with more representation, types III and XIV had the highest mortality rates, each with four deaths out of five cases or 80 per cent. It may be worth noting that in two of the five cases of infection with type XIV (Cases 9 and 23) in spite of evidence of central nervous system involvement in the form of positive cultures of the spinal fluid and infection severe enough to result in a fatal termination, the cell counts of the spinal fluids were very low, 85 and 17, respectively. The type I pneumococcus infection found in six cases is associated with a mortality of 50 per cent. For all other types the number of cases is too small to be worthy of comment.

TABLE IV. CORRELATION OF TYPE WITH MORTALITY

	CASES	DIED	RECOVERED	MORTALITY
Type I	6	3	3	50%
Type II	1	1	0	100%
Type III	5	4	1	80%
Type IV	2	0	2	0
Type V	4	2	2	50%
Type VI	2	1	1	50%
Type VII	1	1	0	100%
Type X	1	1	0	100%
Type XII	1	0	1	0
Type XIV	5	4	1	80%
Type XVIII	3	3	0	100%
Type XIX	1	1	0	100%
Type XXIII	2	0	2	0
Totals	34	21	13	61.7%

Pathogenesis.—It seems clear from findings in the different types of bacterial meningitis that the meninges and cerebrospinal fluid may become involved in any one or more of the following ways:

1. As a result of a bacteremia, organisms may pass directly into the spinal fluid in such a way as to suggest an inadequacy of the blood-brain barrier. This seems to be the case particularly in meningococcic meningitis. It seems quite possible, however, for a similar mechanism to be operating in other types of bacterial meningitis including pneumococcic. 2. Pyemia may be present, and clumps of organisms in infected thrombi may lodge in capillaries of the meninges or brain and set up new areas of phlebitis and thromboses and in that way lead to infection of the spinal fluid. 3. Similar microscopic phlebitis and thrombosis may occur in association with both acute and chronic infection of the temporal bone and the paranasal sinuses, eventually involving the

meninges and spinal fluid by vascular extension. 4. Gross destruction of temporal bone in the mastoid or petrous portions may bring organisms directly in contact with first the dura and then the pia-arachnoid, causing meningitis which may remain localized or which may spread and become generalized. 5. Infection of the semicircular canals or cochlea by extension of infection from the middle ear through oval or round windows and extension of infection through the internal auditory canal may lead to meningitis.

Since in a single case it is quite possible for bacteremia to be present and associated with otitis media, mastoiditis, possibly also petrositis and sinusitis and even lateral sinus phlebitis and phlebitis of smaller vessels in the temporal bone, it frequently seems impossible to state without doubt an exact portal of entry to the meninges. We feel, however, that we should be near the truth if we adopt the following scheme for classifying the means by which the meninges become involved:

1. If during operation gross infection of the temporal bone is found with contiguous involvement of the meninges, the temporal bone is considered the portal of entry with the realization that other portals of entry may exist simultaneously. 2. If at autopsy gross or microscopic evidence of infection leading directly to the meninges is found, again the temporal bone will be assumed to be the portal of entry. 3. If clinical findings, including x-ray, are such as to point clearly to infection in the middle ear and temporal bone, the latter is considered the portal of entry even though operative observation of the temporal bone is not made and autopsy confirmation is not possible. In such instances it is, of course, realized that the hematogenous route exclusive of temporal bone vessels could actually have been operative. 4. When no evidence at all of involvement of temporal bone is found, but when bacteremia is demonstrated by blood cultures, it is assumed that the portal of entry has been by way of the blood stream. 5. When neither bacteremia nor involvement of the temporal bone has been found, but when an upper respiratory tract infection exists, we have designated the upper respiratory tract (U.R.T.) as the probable portal of entry, feeling that the route was really hematogenous with only transient and unrecognized bacteremia present at some time during the course of the infection. 6. If meningitis is found without history or signs of upper respiratory tract infection, involvement of the temporal bone or bacteremia, the portal of entry is designated as cryptogenic with again the thought that it was probably hematogenous.

The importance of establishing whenever possible the portal of entry involves therapeutic considerations especially with reference to surgery for temporal bone infection.

In contrast with the cases of infection by the hemolytic streptococcus previously reported,[1] a clearly established otitic extension of the infection to the meninges is not so regularly found; however, acute infection of the respiratory tract, both upper and lower, commonly preceded the onset of meningitis. In nine cases evidence of otitis media and temporal bone involvement clinically or by x-ray was present, and upper respiratory tract infection only in nine other instances. In eleven cases there was bacteremia, and in four this seemed the only portal of entry. In one case the route of access to the meninges was through the upper respiratory tract by means of a fracture through the nasal bones, in another through the cribriform plate after removal of nasal polyps, and in two by rupture of brain abscesses (one surgical and one spontaneous) which were presumably blood stream in origin.

Temporal bone pathology found in fatal cases from this series and in other fatal cases of pneumococcal infection (eighteen in all) has been studied specially by one of us (D. W.).

The pneumococcus was cultured from the spinal fluid either before death or at post-mortem examination in all cases. In the group there were thirteen children and five adults, six females and twelve males. Five patients only received chemotherapy, the majority occurring before sulfonamide therapy had been developed. Most of the patients survived for an even shorter period than those in the streptococcus group, five having been in the hospital one day or less.

Surveying the pneumococcic group as a whole and comparing it with the *Streptococcus hemolyticus* group, four features appeared in the microscopic sections with a frequency that suggests they are characteristic of the disease. *Purulent labyrinthitis* was the first microscopic finding which occurred with notable frequency. There were eleven cases of purulent labyrinthitis among the eighteen cases with pneumococcus infection as compared with eight cases in twenty-four with *Streptococcus hemolyticus* infection, or almost twice as many. It is of interest to note in this connection that nystagmus was observed clinically in only five cases, and a clinical diagnosis of labyrinthitis was not recorded as such in any of the records.

The second striking feature in the microscopic picture was the occurrence of a rather *constant type of tissue reaction*. There was a tendency for all pneumatic spaces to become filled with a delicate areolar connective tissue. The presence of this type of tissue in the temporal bone sections has long been the subject of controversy in the otological literature. At one time the Hopkins group[2] looked upon it as mesenchymal tissue even though they observed it in an individual of 50 years. In 1933, the observation was made in another laboratory[3] that this type of tissue occurred only where there was evidence of infection and that it differed in characteristic manner from mesenchyme. Mesenchyme spreads an even matrix over the area to be filled whereas this tissue exhibits a definite polarity of the fibroblasts, and the direction of growth is controlled by the stresses and strains put upon it by the presence of the pus and infecting organisms. In the German otological literature this type of tissue has been designated as "empyemic membrane."

Not until the present study did it become apparent that there might be a particular type of tissue response to a particular type of invading organism. In this series of eighteen cases it was observed in all but two. On the other hand we have seen it in occasional cases of streptococcus infection. Whether this means that another unidentified organism (pneumococcus) was also present or not cannot now be determined. It is well known that the organisms in the ear may be different from those causing the general body infection or that additional ones may be present.

A third characteristic of the microscopic picture commonly found in this group was the presence of a *bubbly exudate* usually bluish in the hematoxylin and eosin stain although it occasionally stained pink. Multiple round or oval clear spaces occurred in it as if some fat globules were present. In addition to these, there were numerous large cells with single eccentrically placed nuclei. Some of these cells appeared to have become phagocytic and to have increased in size to engulf several ordinary sized cells. Deposition of fibrin could be seen in the vessels of the middle ear and in occasional pneumatic spaces.

This pathological material was shown to Dr. Eleanor Humphreys, general pathologist of Chicago University Medical School who made the following

comment on the subject: "The tissue shows an active process of organization of exudate in the cells which in places has led to complete obliteration of the pneumatic space. More often, however, this has led to an incomplete filling in by a plug of granulation tissue or loose fibrous tissue. Such plugs are focally adherent to the thickened walls of the pneumatic spaces and between the adhesions are glandlike spaces (cystic spaces) remnants of the original air-containing places. These are not true glands but result from the propagation of the original lining epithelium to cover the surface of the obstructive plug. The process is entirely equivalent to that seen in an obstructing or obliterative bronchiolitis associated with an organizing pneumonia. The likelihood of obliteration of air spaces whether in the ear or in the lung is greater when the inflammatory exudate is rich in fibrin than when it is serous or sanguineous. The importance of formation of these imitation glands is that they limit free drainage and favor persistence of pockets of pus. The greater frequency of occurrence of this type of response in the pneumococcus group is in line with the propensity of pneumococcus to induce fibrin rich exudate. When it was found in *Streptococcus hemolyticus* infection, this may have been due either to more fibrin stimulating power in the organism or to a lack of fibrinolytic activity."

A fourth pathological characteristic which appeared in the pneumococcus group was the frequency of *bilateral otitis media.* A check of the clinical records revealed that here also there was a high percentage of bilateral cases. Eight of the eighteen post-mortem cases had bilateral otitis. Bilateral otitis media was recognized clinically in fifteen of the thirty-four cases reported in this series. In two cases of apparently unilateral otitis, only one ear was examined microscopically. In one case of bilateral otitis, as observed under the microscope, an otitis media had not been discovered clinically. This condition was true also for the streptococcus group, but in that group more cases proportionately were found to be bilaterally involved by microscopic post-mortem examination than had been reported clinically.

There were six cases in which pneumococcus type III was present. Three were adults; three were children. Four of the cases were typed before death. The other two were identified as pneumococcus before death and typed at the post-mortem examination. The two children in the latter group were H. L., 4 years, Case 4, and N. T., 6 years, Case 6. In Case 6 there was a left simple mastoidectomy. Extensions intracranially in this case were at the operative site from retrolabyrinthine cells and through the oval window to the labyrinth. In this respect it was more like the cases in the *Streptococcus hemolyticus* group than like other members of the pneumococcus group. On the whole they did not show much bony erosion. The round window was generally the portal of entry to the inner ear, and in many respects one gained the impression that this was really vascular also via the vessels crossing the membrane. Such vessels were demonstrated by Dean and Wolff.[4] Two of the three children had bilateral otitis clinically. The third had a unilateral otitis clinically (right), and only the right ear was obtained at autopsy. Two cases in this group had a lateral sinus thrombosis. They were the only cases of lateral sinus thrombosis among the eighteen. All but one of the cases of type III showed the "empyemic membrane" previously described, the foamy exudate, and the large ballooned cells with eccentric nuclei. The one exception was a 51-year-old man who had massive quantities of polymorphonuclear cells in the exudate in the ear and a great deal of fibrin forming more or less of a mat in

which these cells were imbedded. The meningeal exudate in this case appeared greenish-yellow at autopsy.

Two cases were identified as having pneumococcus type I ante-mortem. These were F. M., 16 years, and P. P., 7 years, both seen before the discovery of sulfonamide therapy. Clinically and microscopically, both had bilateral otitis media, mastoiditis, petrositis, and apicitis. Microscopically, one was demonstrated to have had bilateral purulent labyrinthitis (P. P.). Extension could be traced intracranialward by multiple routes. The exudate in the middle ear of these two cases did not show the clear globules previously described nor the mononuclear cells with the eccentric nuclei.

There was only one case with pneumococcus type IV identified before death. This was J. B., 2 months. The drum membranes were observed clinically to be dull but did not bulge. She had an active coarse nystagmus and conjugate deviation of the eyes to the left. Microscopic sections of the temporal bone showed a bilateral purulent labyrinthitis, more advanced in the right vestibule. The round window on each side appeared to be the route of extension. Pneumococcus type IV was recovered post mortem in three additional cases. One of these, L. L., 6 months, had *H. influenzae* identified in the spinal fluid and blood ante mortem with a variety of unnamed organisms cultured from the ear. Pneumococcus IV and *H. influenzae* were found in the blood post mortem. The brain showed *H. influenzae,* and from the mastoids pneumococcus IV, *H. influenzae,* and *Staphylococcus albus* were cultured.

Pneumococcus VII was identified from the spinal fluid in A. R., Case 5, 2½ years of age. This child had such a heavy bilateral purulent labyrinthitis with such a mild middle ear infection that it was felt the labyrinthitis must have been retrograde from the meningitis. This was not necessarily so, however, for the inner ear with its nutrient endolymph and perilymph probably affords an excellent culture medium once it is infected with a few organisms.

Pneumococcus XIV was identified post mortem in the case of E. Y., 8 months. A purulent labyrinthitis was present in the one ear received at autopsy. Clinically there was a bilateral otitis media. Extension intracranialward was not definitely traced.

Three other cases in which pneumococcus was recovered ante mortem but not typed were R. A., 13 months, F. S., 11 years, and H. G., 30 years. These three cases had purulent labyrinthitis.

Diagnosis.—In view of the extreme seriousness of the infection, the urgent necessity of promptness in establishing the diagnosis and instituting therapy cannot be too much stressed. Evidence of involvement of the meninges in older children is usually to be expected by frank symptoms in the history with a fairly definite time of onset and by frank signs elicited on physical examination. In the case of infants, composing a fairly large percentage of cases, this is unfortunately not true. Symptoms and signs are often more subtle, sometimes being merely persistence of fever, anorexia, and irritability in spite of signs of subsiding upper respiratory infection. Not infrequently suspicion of presence of meningitis results from observation of an abnormal type of respiration which varies from rapid shallow and fairly regular breathing to the markedly depressed Biot type. A negative Kernig sign is not reliable in such children; a Brudzinski neck sign and bulging fontanelle are more indicative. Of greater diagnostic importance (and graver prognostic significance) are vomiting and convulsions when the latter are not of the type associated with early febrile reaction. For these reasons, there should be no hesitancy in performing lumbar punctures for diagnosis. The importance of

an early diagnosis entirely outweighs any theoretical danger of causing infection of the meninges in the presence of bacteremia, and tests of the spinal fluid are the only reliable criteria for establishing the diagnosis.

When lumbar puncture is performed, opportunity should be taken for obtaining the maximum of information from the procedure. If otitis media is present, especially if neglected or chronic, the dynamics of the spinal fluid should be determined by performing the Tobey-Ayer (Queckenstedt) test although the possibility of involvement of the lateral sinus with phlebitis and thrombosis as the cause of bacteremia is not so great with pneumococcal as with hemolytic streptococcal infections.

The fluid thus obtained should be examined by all means available. Stained smears may reveal numerous organisms which may be identified by direct typing of the spinal fluid in many instances. As we have pointed out before,[1, 5] care should be taken to avoid the errors possible from unskilled examination of such stained smears, as with fair frequency the meningococcus may be mistaken for the pneumococcus or vice versa, and the mistake might delay proper therapy for as long as forty-eight hours. It may be seen from examination of Table II that in numerous instances organisms were not seen on direct examination of the fluid but were obtained on culture, in some cases only when the best culture media at our disposal, the fertile egg membrane, was employed. Cultures should be made on blood agar with optimum conditions for growth, and the egg membrane employed whenever available to obtain a higher percentage of correct diagnoses by culture confirmation, especially when organisms are apparently absent on stained smear.

It should also be recognized that characteristically pneumococcal infections tend to show many organisms in the spinal fluid with few cells. Occasionally such fluids may fail even to be turbid when only a few organisms are present and pleocytosis is not marked. This is especially likely to be true if some sulfonamide therapy has been instituted for the original infection leading to meningitis but may occur both during the initial period of untreated meningitis and as the initial phase of relapse when therapy had been discontinued or reduced to an inadequate level.

It should also be recognized that there seems to be an inherent difference between fluids obtained from the lumbar spine and from the cisterna magna. We have frequently obtained fluids simultaneously from these two sources and found the latter relatively clear, sometimes sterile, sometimes with relatively few organisms, while spinal fluid was grossly turbid with many organisms and cells. In these respects, ventricular fluid resembles more cistern fluid.

It is, therefore, incorrect to assume that clear spinal fluids need not be cultured on the assumption that they cannot be infected, and it is a principle with us to culture all fluids when secured because of suspicion of meningitis.

While we regard it as very important to make an accurate bacteriologic diagnosis, we should emphasize that it should not delay initial treatment which should be of a type sufficient to control the most serious forms of meningitis.

Management.—It is possible because of the broad coverage of the more recently introduced sulfonamide drugs to be reasonably certain of using them in such a manner as will insure proper treatment against most of the known etiological agents of purulent meningitis. Maximum dosages are employed immediately, approximating 0.6 Gm. per kilogram body weight per twenty-four hours of one of the broad coverage drugs, bearing in mind that this dose may be reduced if the diagnosis should prove the infection to be that of a less

serious type of meningitis. Such amounts may be expected to produce blood levels averaging 30 mg. but occasionally higher than 40 mg. per 100 c.c. These levels are well tolerated by children, provided that adequate fluids are given to produce good urine output and care is taken to maintain the urine at an alkaline pH. For reasons discussed in a previous communication,[5] these objectives were accomplished by administration of sulfonamide drugs parenterally in 0.5 per cent solution subcutaneously at least in the earlier period of the illness and by giving sodium lactate orally or in parenteral fluids in amounts approximating 30 c.c. per kilogram of ⅙ molar solution for a twenty-four-hour period. This latter measure has been found to maintain the urine at pH greater than 7.4 in the majority of instances.

In addition, since the pneumococcus is within the category of organisms susceptible to penicillin, this drug should also be employed as early as possible.

Specifically, our present routine is as follows: As soon as the presence of a purulent meningitis is established, 20,000 units of penicillin in a volume of fluid somewhat less than that removed is injected through the same needle used for lumbar puncture, and another injection of penicillin is made intramuscularly or subcutaneously in a dosage of 10,000 to 20,000 units. An initial subcutaneous dose of the sodium salt of sulfadiazine or sulfamerazine in no more than 0.5 per cent concentration is administered with the addition of an initial amount of sodium r-lactate of 30 c.c. of ⅙ molar solution per kilogram body weight if there are no signs or symptoms suggesting marked acid-base balance change. The inclusion of such potential alkali in this first injection is to assure an early secretion of alkali in the urine. It is to be noted that the remainder of the total fluid is to be added in the form of hypotonic (Frog) Ringer's solution, so that the resulting hypotonic solution will avoid salt retention and insure early diuresis.

Therapy is continued then by subcutaneous administration of 0.1 Gm. per kilogram of the sodium salts of these drugs in 0.5 per cent or less concentration every eight or twelve hours, employing the former scheme until good high levels in the blood are proved by actual determination. One-third of the total potential alkali per twenty-four hours (10 c.c. per kilogram of ⅙ molar solution of sodium lactate) is given with each eight hourly administration of drug.

By these means the desirable high blood levels are built up very quickly (usually in one-half hour); good urine flow is assured, and there is avoided the very high peak blood level which an initial intravenous administration causes, and thus perhaps there is also avoided early precipitation of drug in the kidney tubules when the urine is still concentrated and acid. Penicillin injections subcutaneously are continued every two hours unless an indication arises to change the amount or method of administration. In addition to subcutaneous or intramuscular injections, penicillin should be placed directly into the subarachnoid space, 10,000 or 20,000 units, since it does not always diffuse into the spinal fluid in adequate amounts[6] even though adequate blood levels exist.

The result of initial treatment should be evaluated at twelve hours by another lumbar puncture. If antibiotic treatment and chemotherapy have been effective, an early favorable response is seen in reduction of the number of organisms and an increase in the number of cells if originally low. If such response is not seen by this time, advantage should be taken of the benefit of specific serum therapy when it is available. In very early cases an intravenous dose of serum may be sufficient, but if after an early favorable re-

sponse improvement does not continue and organisms are not completely eradicated from the spinal fluid, further serum therapy should be administered both by intravenous and intrathecal injection. When the latter is employed, it will be helpful to add some freshly obtained human serum for complement effect. Occasionally, benefit seems to be obtained by injection into the basal cistern and into the lateral ventricles.

Continued penicillin and sulfonamide therapy is necessary for a period of ten days to two weeks in favorable cases and may be necessary for much longer periods in others. In one instance (Case 25) it may be seen that even a very long period (twenty-four days of intensive chemotherapy) did not eradicate the infection, and relapse occurred, necessitating another extended period of treatment (thirty-nine days). In this case and in another (Case 20) serum therapy used late in the illness seemed to influence the course favorably.

After favorable response and when the spinal fluid cultures have proved sterile for forty-eight hours, the blood levels of sulfonamide may be reduced by one-third. In most cases it will be possible by this time to rely on oral drug administration. This may not be possible, however, if vomiting is frequent. Amounts approximating 0.4 Gm. per kilogram per twenty-four hours, if given orally, and parenterally administered drug in smaller amounts (0.2 to 0.3 Gm. per kilogram per twenty-four hours) usually maintain blood levels of 15 to 20 mg. per 100 c.c.

In following the course of these patients, it should be noted that the cultures following institution of penicillin therapy for but a single day are rarely positive, although clinically the patient in other ways may show little favorable response to therapy. Presence of penicillin in the material to be cultured on agar plates, in broth, and on egg membrane seems to inhibit growth completely, but it is not possible to state with certainty that viable organisms are not present. It is possible that if we had removed penicillin by enzymatic destruction[7] or by some other means, growth of organisms might have resulted. It certainly has been common to note continuance of clinical symptoms of infection, as in Case 29, while cultures remain negative. In this case, penicillin alone was employed, and while the expected early improvement was secured, the complete recovery seemed delayed because, we think, no sulfonamide therapy was employed.

For these reasons, we believe that both agents should be used as outlined to obtain the best therapeutic effect. Intrathecally injected penicillin provides quick destruction or inhibition of easily accessible organisms in the spinal fluid, while sulfonamide therapy seems more helpful and even necessary for final clearance of infection in less accessible areas.

In addition to the specific measures outlined, proper care must be given to accompanying conditions which may complicate the illness. Relief of any dehydration or acid-base balance change should be undertaken at once. Convulsions demand control by whatever measures suffice. If there is an accompanying respiratory infection of some severity, if fever is very high, and if periods of apnea or cyanosis are present, effectual oxygen therapy in an oxygen tent or Burgess box should be employed. Anemia and hypoproteinemia are corrected by whole blood or plasma transfusions. Parenteral administration of dextrose and Amigen[8] may be required for maintenance of adequate nutrition.

Concomitant and complicating infections of the upper and lower respiratory tract will usually be adequately cared for by the drug treatment designed for the meningitis. Even otitis media with purulent drainage may completely

disappear. In cases of infection of the middle ear and adjacent structures in the temporal bone, whether acute or chronic, local measures are employed whenever possible, and finally surgical intervention may be necessary.

The presence of the empyemic membrane impeding drainage may make the infection of the temporal bone more difficult to eradicate through chemotherapy than is the case in hemolytic streptococcus infection. Therefore, when there is good clinical or x-ray evidence of temporal bone involvement and continuance of such evidence in spite of treatment, we believe surgical exploration of the mastoid is indicated. However, since the incidence of temporal bone infection is so much lower than when streptococcus is the etiological agent, if such evidence is lacking, we do not advocate mastoidectomy. In only eight cases of the thirty-four in this series was mastoidectomy performed and in one case antrotomy. It seems advisable usually to eradicate or at least control an acute disseminated meningitis before instituting such surgical procedures as mastoidectomy.

Results.—The over-all mortality of this series including cases treated with sulfonamide drugs alone and those in which penicillin also was employed was twenty-one deaths in thirty-four cases, a rate of 61.7 per cent. Of the twenty-one fatal cases, eight were admitted in a moribund state and died on the day of admission. One died on the second and three on the third day. The remaining nine died after sufficient time had elapsed for the full therapeutic benefit of sulfonamide drugs or penicillin or the combination to have been obtained. It is worthy of note that in two cases (J. R., Case 27, and D. J., Case 28) that although consistently sterile and clear spinal fluid was obtained in the later samples, a fatal termination resulted, and autopsy revealed a degree of cortical brain destruction hardly compatible with life. In those cases treated with penicillin or with penicillin plus a sulfonamide, there were four deaths out of seven.* All of the fatal cases received some sulfonamide and serum in addition to penicillin. In the two cases referred to above (Cases 27 and 28), the use of penicillin was too long delayed, since it was undertaken after failure of treatment by other measures, and a fatal destruction of brain tissue was present even though the infection was apparently conquered. It is interesting also that the first case ever to have recovered at St. Louis Children's Hospital from proved pneumococcus meningitis (type V) did so on sulfanilamide alone. One case improved on penicillin alone (Case 29). Six of the fatal cases received sulfanilamide only, and nine of the fatal cases received antiserum in addition to chemotherapy and other measures. In one patient (Case 14) an initial favorable response was obtained, but at that time the importance of long-continued high concentrations of drug in the spinal fluid was not appreciated, and with too early discontinuation of parenteral drug administration an exacerbation of infection ensued which could never thereafter be controlled.

Serious sequelae in the nonfatal cases are fairly frequent in this infection. In almost all cases tested by means of the pneumo-encephalogram, there was dilatation of the ventricles which varied from very slight to marked. This finding is regarded as indicating the presence of an internal communicating hydrocephalus, and so constant in occurrence is this phenomenon that we believe it is the rule. The mechanism of its production presumably lies in failure of resorption of cerebrospinal fluid over the cortex by the damaged meninges with resulting accumulation of the fluid both within the ventricles and in the subarachnoid spaces. In these patients on whom it was possible to make later

*Since the completion of this paper, another infant was successfully treated.

studies there was regression of the x-ray signs to a certain point, indicating the possibility of delayed but complete disappearance of the dilatation as resorption becomes more normal. Mental retardation is more characteristic of those who had the disease in infancy and in whom it was very severe. In Cases 8 and 29, having the disease in infancy, this retardation was especially marked, in the first case leaving the child a low-grade ament and in the second, severely retarded and with clinical hydrocephalus. In three cases, 20, 25, and 30, only a mild degree of retardation is seen in two and none evident in one, although the infection occurred in infancy. In Case 25, there is a persisting left hemiparesis and speech retardation with occasional clonic convulsions of the left side which may be shown by pneumo-encephalogram to be correlated with atrophy of the right cerebral cortex. In one instance the infection occurred in very serious form at the age of 5 years (Case 21), and a steady loss of I.Q., aphasia, and epileptiform seizures followed. In Case 8, there was seen a period in which convulsions tended to persist but which ceased rather abruptly after a pneumo-encephalogram was performed about a year later. There seems to be no good explanation for this event.

Surprisingly little may be observed clinically in a child when there exists marked dilatation of the ventricular system. This is illustrated in Case 30, where at 7 months mental developmental examination revealed no abnormality, although the air studies on the child showed tremendous enlargement of the ventricles. Such a good result is probably due to preservation of cerebral cortex despite hydrocephalus. Considerable ventricular dilatation was also present in Case 20, and the child when examined at 3 years did not show any detectable deviation from the normal, although an accurate mental examination was not then made.

In Case 25, the difficulty in completely eradicating the infection is well illustrated. This child was observed in the hospital for twenty-two days after cessation of chemotherapy and had had consistently negative spinal fluid examinations for most of this period but after a very short stay out of the hospital returned with recurrence or relapse of the meningitis. This represents our most striking example of return of full clinical symptoms, but in a number of other cases there were recurrence of fever, an increase in the cell count, and an occasional positive culture as late as twenty to thirty days after beginning of treatment (longest was thirty-one days in a nonfatal case).

SUMMARY AND CONCLUSIONS

A review is given of clinical, laboratory, and post-mortem studies of all cases of pneumococcal meningitis admitted to the St. Louis Children's Hospital from the time the first sulfonamide drug was available for treatment (December, 1936) to November 1, 1944. As a result of these studies, the following conclusions have been reached:

1. Apparently any type of pneumococcus may cause meningitis (thirteen different types having been found in this series), but those generally considered most virulent (I, III, and XIV) predominate.

2. The pathway by which the pneumococcus may gain entrance to the meninges and spinal fluid varies and should whenever possible be established because of its possible surgical implications. The incidence of "surgical" mastoiditis as a portal of entry is much greater than in meningococcal but also apparently much smaller than in hemolytic streptococcal infections.

3. When the temporal bone is involved, there seems to be a characteristic pathology which includes (1) a high incidence of purulent labyrinthitis, (2) the formation of "empyemic membrane," (3) peculiar organization of bubbly exudate which leads to pseudo-gland formation, and (4) a high incidence of bilateral involvement.

4. A diagnosis of pneumococcal meningitis can be made with certainty only by lumbar puncture and proper examination of the spinal fluid. The very great value of early diagnosis far outweighs any theoretical danger imposed by lumbar puncture.

5. Treatment should be started as early as possible with penicillin and sulfonamide in high dosage, according to some such plan as outlined in the text and should not be discontinued too soon.

6. Mortality seems more related to delayed diagnosis and institution of intensive therapy than to any other single factor.

7. Sequelae, such as hydrocephalus, epilepsy, and mental retardation, may be expected, especially when the infection occurs during infancy and is not eradicated immediately.

REFERENCES

1. Hartmann, A. F., Wolff, D., Love, F. M., and Kendall, B. S.: J. PEDIAT. 21: 591, 1942.
2. Crowe, S. J., and Polvogt, L. M.: Arch. Otolaryng. 12: 151, 1930.
3. Wolff, D.: Ann. Otol. Rhin. and Laryng. 43: 193, Figs. 22 and 23, 1934.
4. Dean, L. W., and Wolff, D.: Ann. Otol. Rhin. & Laryng. 43: 702, Fig. 3, 1934.
5. Hartmann, A. F., Goldring, D., Maxwell, R.: J. PEDIAT. 26: 1, 1945.
6. Cooke, J. V., and Goldring, D.: J.A.M.A. 127: 80, 1945.
7. Lawrence, C. A.: Science 99: 15, 1944.
8. Hartmann, A. F., Lawler, H. J., and Meeker, C. S.: J. PEDIAT. 24: 371, 1944.
9. Evans, W. A., Jr.: Arch. Neurol. & Psychiat. 47: 931, 1942.

American Academy of Pediatrics

Proceedings

Report of the Meeting of the Executive Board of the American Academy of Pediatrics

Chicago, Ill., June 15-16, 1945

A meeting of the Executive Board was held at the Palmer House, Chicago, on Friday and Saturday, June 15 and 16, 1945. The first session was called to order at 10 A.M. Friday by the President, Dr. Joseph S. Wall. There were present: Drs. Joseph S. Wall, Jay I. Durand, Marshall C. Pease, Clifford G. Grulee, Edgar E. Martmer, Oliver L. Stringfield, James W. Bruce, Lee F. Hill, George F. Munns, Hugh K. Berkley, Vernon W. Spickard; and, by invitation, Félix Hurtado, of Havana, and Luiz Barbosa, of Rio de Janeiro (Saturday A.M.).

The following applicants were elected to Fellowship:

Region I

Fred Harold Allen, Jr., Holyoke, Mass.
J. Edmund Bradley, Baltimore, Md.
John F. Burn, Butler, Pa.
Meyer Carr, Hamilton, Ont., Canada
Ethel G. Cermak, Albany, N. Y.
Curt H. Falkenheim, Rochester, N. Y.
Gertrude Felshin, New York, N. Y.
Raymond G. Filsinger, Buffalo, N. Y.
William H. Fost, Belleville, N. J.
James LeRoy Foster, Pittsburgh, Pa.
Harold J. Freedman, Boston, Mass.
Ernest Freshman, Oneida, N. Y.
John L. Green, Philadelphia, Pa.
Daniel C. Hackett, Rochester, N. Y.
Olga Haller, Newark, N. J.
Frank D. Hazlett, Washington, Pa.
Harold Herman, New York, N. Y.
Jacob J. Lichterman, Brooklyn, N. Y.
Richard R. O'Toole, Pittsburgh, Pa.
David C. Pewterbaugh, York, Pa.
Jacob D. Pinson, Philadelphia, Pa.
Frances E. M. Read, Baltimore, Md.
Julian L. Rogatz, New York, N. Y.
Herman Schneck, New York, N. Y.
Roland B. Scott, Washington, D. C.
Lillian Shulsky, Brooklyn, N. Y.
Irving Silverman, Boston, Mass.
Alonzo deG. Smith, Washington, D. C.
Leon Sternfeld, Albany, N. Y.
Dorothea D. Vann, Englewood, N. J.
Carl Edward Weigele, Trenton, N. J.
Blandina Worcester, New York, N. Y.

Region II

Jules I. Klein, Morgantown, W. Va.
Weldon A. Price, Arlington, Va.
Joe M. Strayhorn, Nashville, Tenn.
Leta J. White Petersburg, Va.
Dorothy B. Wyvell, Dallas, Texas

Region III

Stuart Lane Arey, Minneapolis, Minn.
A. Robert Bauer, Detroit, Mich.
Franklin A. Benes, Shaker Heights, Ohio
Earl W. Brubaker, Lansing, Mich.
William V. B. Deering, Chicago, Ill.
Martin J. Hurst, Kansas City, Mo.
Maurice W. Laufer, Yellow Springs, Ohio
Robert A. McGuigan, Evanston, Ill.
John Fleek Miller, Newark, Ohio
Edward B. Plattner, University City, Mo.
Paul H. Rhodes, Denver, Colo.
Maryelda Rockwell, Clinton, Iowa
Alfred S. Schwartz, St. Louis, Mo.
Clark W. Seely, Kansas City, Mo.
Homer F. Weir, Rockford, Ill.
Beulah Wells, Cleveland, Ohio
Vida B. Wentz, Chicago, Ill.
Thelma M. Wygant, Detroit, Mich.

Region IV

Harry H. Clemens, Marysville, Calif.
Percy Hall Jennings, Jr., Berkeley, Calif.
Thelma Jean Lovett Jennings, Berkeley, Calif.
Agnes Groves Plate, San Francisco, Calif.
Frederick W. Rutherford, Seattle, Wash.
Glenn Simpson, Victoria, B. C., Canada
C. Michael Witzberger, Tucson, Ariz.
William H. Zavin, Portland, Ore.

Region V

Arturo J. Aballí, Havana, Cuba
Gabriel Barrera Moncada, Caracas, Venezuela
Carlos E. Costillo, Maracaibo, Venezuela
Ernesto G. Cofiño, Guatemala, Guatemala
Edwardo Corrêa de Azevedo, Rio de Janeiro, Brazil
Adán Cuadra Zavala, Granada, Nicaragua
Manuel M. Lander, Caracas, Venezuela
José Robalinho de Oliveira, Pernambuco, Brazil
João Rodrigues de Souza, Pernambuco, Brazil
Rafael Salas, Caracas, Venezuela
L. Zapata González, Lara, Venezuela
Agustín Zubillaga, Lara, Venezuela

The following, on application, were granted Emeritus Fellowships:

Dr. N. O. Pearce, Minneapolis, Minn.
Dr. John T. Thornton, Charlottesville, Va.

The resignation of Dr. J. Gurney Taylor, of Milwaukee, Wis., as of July 1, 1944, was accepted.

Report of the President

It has seemed fitting that the President of the Academy present to the Board a report of stewardship since its last meeting in November, 1944, upon the occasion of the very successful general meeting held in St. Louis, which was attended by a large and enthusiastic number of Fellows who seemed to crave a renewal of that pleasant personal association for which the Academy is noted.

It seems evident that there will be no annual meeting this Fall, although the President and Secretary, following closely upon the meeting last November, initiated preliminary plans for a general meeting this year to be held either in Buffalo or in Cleveland, as they had been directed to do by vote of the Academy in November last.

During latter December, fairly definite plans had been made for the annual meeting to be held in Cleveland, Ohio, on November 8, 9 and 10, 1945, and the Secretary promised to visit that city to further arrangements for our convention.

It was noted in the press a short time thereafter that a Committee on Conventions had been formed in the Federal Office of Defense Transportation, the purpose of which was to issue permits for conventions and to deny those permits to organizations, as measured by a yardstick, to quote Colonel Johnson, the Chairman, "The essentiality of any meeting is how the winning of the two wars we are now fighting will be impeded if the meeting in question were held to an attendance of 50 or cancelled outright."

In view of the proposed meeting of Region I in March and that of the Academy in November, 1945, the President sought and received an opportunity to confer with Mr. Richard Clare, secretary of the committee, after having set forth by letter and exhibits a plea for the two meetings just mentioned, the closing paragraph of the communication reading as follows: "In re the Annual Meeting of the Academy, now planned for November 8, 9, and 10, 1945, in Cleveland, we would also ask authorization from your office in view of the active participation of pediatricians not only in the care of children of servicemen, but that of the children of our Nation as well, whose present and future postwar protection is an inherent function of the Academy of Pediatrics—an interest of altruism which it would seem should meet with your favorable consideration."

After many conferences with the Secretary and the Chairman of Region I, Dr. Stringfield, and further conferences with Mr. Richard Clare of the Office of Defense Transportation, a final request was submitted on January 19, 1945, together with official application forms which closed with this final paragraph: "The officers and members of the Academy of Pediatrics would request approval for this meeting (Region I) only upon the basis of a contribution to the war effort, and, if the opinion of the War Committee on Conventions is to the contrary, please consider this request for Region I meeting, together with that for

the larger Annual Meeting of the Academy of Pediatrics scheduled for November in Cleveland, Ohio, requested in my letter of January 8, respectfully withdrawn from your consideration.''

In late January, through information provided me by Mr. Clare, and by way of certain underground channels established with the Office of Defense Transportation through the kindness of a Washington Fellow of the Academy, it became evident that our requests would in all probability be denied. After conferring with Dr. Stringfield, and he in turn with several influential members of Region I, it was decided to withdraw our application for Region I meeting, which, by implication of previous letters to the Office of Defense Transportation, also automatically withdrew our request for the Annual Meeting. Regarding the cancellation of the meeting of Region I; the members of the Academy were notified by letter from the Secretary's office.

To ensure continuing activity and interest in Academy affairs, more especially because of the omission of meetings during the year, with the aid of the Secretary and many members, there has been considerable revamping of standing and other committees as a result of which we hope, and are reasonably sure, that the functions of the Academy will be carried on at a high level of usefulness.

Upon the advice of its chairman, the Committee on Camps was liquidated, its functions merged with the Committee on Cooperation with Nonmedical Groups, the chairman of the former now being carried on the membership of the latter.

The Committee on Fetus and New-Born was radically changed as to membership and the chairman, the new chairman being Dr. Ethel Dunham; but this committee still retains a title which, in my mind, is rather offensive to the nostrils of microsmatic and intellectual pediatricians. I would recommend that the title be changed!

The Committee on Vitamins has been omitted and merged with the Committee on Nutrition, the members of the former having always been carried as members of the latter.

A strong and active Committee on Post-War Courses in Pediatrics has been formed with Dr. Irvine McQuarrie as Chairman and has already shown much diligence in efforts to provide refresher courses for returning pediatricians.

The Committee on National Defense, in view of the favorable war situation which has lessened its duties, has been abridged from a membership of thirteen to eight.

The Committee on Liaison with the American Legion has been reformed under the able chairmanship of Dr. Hugh McCulloch, who has been asked to attend this meeting of the Board and to report upon the activities of his group which have been strikingly energetic.

The Committee on Post-War Planning has had rather difficult sledding since it was constituted by vote of the Academy last November.

A meeting was held at the writer's home on December 8, 1944, at which there were present five out of the nine members, and also Dr. Martha Eliot and Mr. George Perrott of the United States Public Health Service, representing the two organizations whose help had been asked in the work of the committee. An estimated cost of $8,000 was agreed upon for the work of the committee and was later authorized by the Executive Board through a poll by the Secretary. It was later realized that the sum first suggested at the December meeting would probably prove insufficient, and a successful attempt was made to supplement this amount through an approach to Dr. Cox, by the Secretary, and to Mr. A. L. Rose, Vice-President of Mead Johnson and Company, by the President, the latter having given assurances of interest and aid after hearing the report by Dr. Helmholz at the November meeting. The President of the Academy at once received a communication from Mr. Rose pledging financial aid to the extent of $8,000, which Mead Johnson and Company would make immediately available.

The greatest task confronting the committee was the selection of an executive, but with the aid of the director of personnel of the Children's Bureau at least four candidates were interviewed personally or by letter by the President of the Academy, while the two most promising were personally seen by Dr. Sisson at a later date. No eventual choice has as yet been made, due to many circumstances. These searches had to be carried on by the writer because of the illness of Dr. Helmholz in the early part of 1945 and his later absence from Rochester during his convalescence.

In early March, Dr. Helmholz was compelled upon orders of his physician to relinquish his post as chairman of the committee, which necessitated the selection of another chairman. Coincident with the meeting of the Board of Pediatrics in New York City during latter March,

a meeting was called of the Eastern members of the committee for March 31, five committee members being present, as well as upward of fifteen influential Fellows then conducting examinations for the Pediatric Board. Dr. Warren R. Sisson was elected Chairman of the Post-War Planning Committee and has since devoted considerable time and effort to the solution of its problems. He has been invited to attend this meeting of the Board, together with Dr. Helmholz, the original chairman.

On May 2, 1945, a conference was held with Dr. Thomas Parran and several members of his staff, Dr. Van Horn representing the Children's Bureau together with Mr. Schwartz, director of personnel, Dr. Butler of the Committee and the President of the Academy. At this meeting Dr. Parran assured us of his interest and promised the designation of a full-time aid, as well as assistance from other members of his staff. Dr. Sisson will report on the details of his own conversations with Dr. Parran.

There has been at the time of the writing of this report, another meeting in prospect which has been called for June 9, which will be attended by Dr Sisson and, if possible, other members of the Post-War Committee, including also Dr. Bain, designated to aid by Dr. Eliot, Dr. Williams, designated for full-time service by Dr. Parran, and others of the United States Public Health Service. Dr. Sisson will report to the Board the details of his activities.

In regard to the relations of the Academy with and cooperation with the Children's Bureau, the writer would report that he was invited to attend the organization meeting of the newly formed Steering Committee of the Children's Bureau on January 28, 1945. This Committee was formed by the Bureau to consist of the chairman of standing advisory committees and subcommittees of the Children's Bureau, and its purpose may be implied from the first paragraph of its recommendations, to wit: "There is ample evidence that urgent need exists for a widespread expansion of local, State, and Federal programs to assure the accessibility of health and medical services to all mothers and children."

The aid of the Academy, through its president, was sought by the Children's Bureau in securing information from pediatricians concerning their experiences along the following lines:

1. Average annual number of office visits (for health supervision and/or office care when sick) per infant regularly under care.
2. Average annual number of office visits for health supervision per infant regularly under care.
3. Average number of office visits for office care when sick per infant regularly under care.
4. Per cent of all infants under care receiving home or office visits after first two weeks of life.
5. Average annual number of hospital and home visits combined per infant under care after first two weeks of life.

Of a total of 493 questionnaires sent to pediatricians in the 48 States, the District of Columbia, Hawaii, and Puerto Rico, one-half, or 247, completed questionnaires were returned. A statistical analysis of these will enable the Children's Bureau to ascertain the experience of pediatricians in their individual practices along the lines of the inquiries named, and, it is thought, will enable the administrative authorities to correct any inequities now existing in the operation of the EMIC program, several of which the Bureau admits need adjustment, especially in regard to compensation for over-all care of infants.

On the occasion of a recent visit of the President to Columbia, S. C., he had the opportunity to meet in conference with a majority of the Academy membership in that State, together with the State Health Officer and the State Maternal and Child Health Director, to consider several problems arising in the administration of the EMIC program.

From several sources the President of the Academy has received complaints from Fellows of the Academy who are perturbed after reading statements emanating from the Children's Bureau regarding proposed expansion of the scope of the Crippled Children's Division to include conditions other than orthopedic or plastic states within the benefit of the Bureau's ministrations.

To the best of the writer's knowledge, the first mention of such expansion was made by the Chief of the Bureau, Miss Lenroot, in a "Statement on Physically Handicapped Children," submitted to the Subcommittee to Investigate Aid to Physically Handicapped of the House Committee on Labor, Nov. 29, 1944, in which Miss Lenroot calls attention to "The importance of greatly extending and improving services for physically handicapped children in the United States (which) has been highlighted by experience with selective service examinations during the war."

Miss Lenroot advises the inclusion of children with visual defects; with hearing defects; children with diabetes; with convulsive disorders; those with major allergic conditions, and children with tuberculosis and congenital syphilis.

Next in sequence, appearing among the recommendations of the Children's Bureau Advisory Committee on Services for Crippled Children, resulting from its meeting Dec. 7 and 8, 1944, is an item on page 2, section 2, (a), which reads as follows: "Services under crippled children's programs should be provided to children with such conditions as rheumatic fever, eye defects, ear defects, convulsive disorder, allergy, diabetes, nephritis, childhood tuberculosis, *and so forth.*" (The last three words italicized by the writer.) It is the writer's impression that several pediatricians, including the Secretary of the Academy, attended this meeting of the Crippled Children's Advisory Committee.

At a meeting of a special committee appointed by Dr. Eastman to correlate the reports of the Maternal, Child Health, and Crippled Children's groups held at eight-thirty on the morning of Dec. 8, Dr. Eastman read his Maternal report; Dr. Helmholz, the Child Health report; and Dr. Miller, on behalf of the Crippled Children's group, stated that their report "was the same as adopted by his committee yesterday." In the Bureau's published summary of reports appears the following, under Crippled Children's Services: "Crippled children's services should be expanded as rapidly as possible to provide full and complete care for all children who suffer from any kind of physically handicapping condition or any condition that may be potentially handicapping, such as rheumatic fever, eye defects, ear defects, convulsive disorders, allergy, diabetes, nephritis childhood tuberculosis, *and so forth.*" (The last three words italicized by the writer.)

The writer submits the above record concerning expansion of the crippled children's program without comment or prejudice, but for the information of the Executive Board.

The President would report interesting and helpful contacts by letter and personally with Colonel Leonard Rowntree and Dr. Olin West, both of whom have expressed interest in our postwar endeavors. He would also express appreciation of help and interest on the part of Dr. Joseph Lawrence, Executive Officer of the American Medical Association Council on Medical Services and Public Relations.

I would recommend to the Board that it give consideration to the following matters:

The question of raising the annual dues.

The question of limiting the term of State Chairman to four years, with the right to reappointment for an additional four years. The writer believes that such a change in the By-Laws would work benefit for the Academy, and that such a change would be consistent with the requirements for the terms of office for Regional and Associate Regional chairmen.

The question of subscribing to the Child Welfare Information Service, Incorporated, a sample of one of its publications being submitted for inspection by the Board. If subscription is authorized, we would suggest that $25 be apportioned for this purpose.

Respectfully submitted,
JOSEPH S. WALL, President.

Report of the Secretary

The excellent report of the President makes it unnecessary for your Secretary to go into matters about which he has told you. There has been submitted to the Executive Board a number of propositions since the meeting last November. Among these the following may be noted: first, the revision of the American Legion Committee, Dr. Hugh McCulloch as Chief Liaison Officer and Dr. E. C. Mitchell as Honorary Liaison Officer; second, the Executive Board concurred in the dropping of certain committees, namely, the Committee on Camps which was included with the Committee on Cooperation with Nonmedical Groups; the Committee on Vitamins which was incorporated with the Committee on Nutrition, and the Committee on Pediatric Research which was dropped entirely; third, you have been sent the report of Dr. Hurtado, which you will be asked to discuss with him at this meeting.

Fourth, with respect to the Post-War Planning Committee, you have been offered $8,000 from Mead Johnson and Company for the survey which you most gladly accepted. Fifth, likewise you have agreed to the spending of a small amount of money to obtain from the American Hospital Association the material which they are using in a survey of a similar nature, and which was sent to the members of the Committee.

Sixth, the vote on the request of the DeVilbiss Company to appeal to the government for material for manufacturing a vaporizer was so indecisive that your Secretary reported to the DeVilbiss Company that he could not make the appeal.

The concern of the Academy has largely been, during the past months, with postwar activities. We have, as you all know, spent a great deal of time trying to make the situation regarding postwar planning adequate and rational. Your Secretary met with the group in New York, as Dr. Wall has already told you, and he has had conferences with Drs. Sisson and Helmholz. It is of advantage that this matter of arranging for the survey should be taken up deliberately and carefully, and we may hope that under the present conditions the proper decision will be made. It is a very important survey and one which is of vast possibilities, and to rush into it without proper consideration might be fatal. In this connection, it will be of value to the Academy to have the Report of Dr. Goehle of the Committee on Geographical Distribution of Pediatricians. This well-worked-out report will be presented later and may have some value for the postwar planning group.

The second project which has been close to the hearts of all of us has been the question of training for men in the Armed Services after their return. A very competent and very active committee under the Chairmanship of Dr. McQuarrie will report to you at this meeting.

With the idea of needing larger quarters for the Post-War Planning Committee's office, the President and Secretary signed a lease for the Academy for quarters on the eighth floor at 636 Church Street, Evanston, Ill. These quarters will increase our space by one room and added space in the storeroom, which is very much needed.

We have still been very much interested in the Latin-American situation, and we hope with the help of Dr. Hurtado to suggest measures which will meet the situation, and, at the same time, be agreeable to the members of Region V. There is still some question regarding the status of three members from Argentina, about which there has been some confusion. The original slip may have been in the Secretary's office.

The scholarships have been most popular, and we have at present sixteen scholars in this country, two of whom are studying English, and some of whom are on special scholarships for pathology and surgery. It will probably be necessary to curtail our activities in this regard in the not distant future in order to take care of men coming home from service. There are many, but slight, difficulties in this program which will be reported on by Dr. Helmholz at this meeting.

I must call your attention again to the fact that the Academy is very unevenly divided as to membership in Regions, and that this discrepancy is increasing rather than decreasing. Region I contains almost 700 members without the addition of those who will have been elected to membership at this meeting, and the applications for Region I have continuously been as many as from all the other Regions and frequently more. It seems to me that we should consider the question of redistricting the whole Academy.

It is my unpleasant duty to have to report the deaths of the following Fellows since our meeting in November:

Madeline M. Melson, Little Rock, Ark.
Claude McKinley Burpee, Augusta, Ga.
Maurice L. Blatt, Chicago, Ill.
Branch Craige, El Paso, Texas
William D. Lyon, Andalusia, Ala.
J. T. Simonson, New York, N. Y.
Louis Fischer, New York, N. Y.
Angus B. Cowan, Fresno, Calif.
William A. Mulherin, Augusta, Ga.
Herman Schwarz, New York, N. Y.
Thomas E. Buckman, Jacksonville, Fla.
Edwin J. Barnett, Spokane, Wash.

and one Associate Fellow, namely, Dr. S. Josephine Baker, Bellemead, N. J.

Respectfully submitted,
CLIFFORD G. GRULEE, Secretary.

Report of the Treasurer

The Treasurer's Report is before you. It is evident from it that we shall have a very great deficit in the coming year without an increase of revenue. As a matter of fact, it is altogether likely that by the time July first comes around there will be a deficit in our checking account which will have to be made up by taking money from the savings account. As near as the Treasurer can determine, this deficit is due to the fact that we have 372 men in service who are not paying dues. He would, therefore, suggest that this deficit be made

up by special wartime assessment of $5.00 a year to each member until such time as the members who are in service return to paying dues. This means at least one year after their discharge from the Armed Services. After careful consideration of the various items in the budget, he does not see how any reduction can be made which would affect this to the degree that a special assessment would not be necessary. During the period when we are not allowed to hold general meetings, it seems highly advisable that we should spend more money providing for meetings of committees. Such committee meetings will frequently be on very short notice. It is, therefore, advisable that the Secretary have an emergency fund to meet such situations which is large enough to cover the expense.

Respectfully submitted,

CLIFFORD G. GRULEE, Treasurer.

Report of the Treasurer

STATEMENT OF RECEIPTS AND DISBURSEMENTS, JULY 1, 1944 TO MAY 31, 1945

Balance in checking account, July 1, 1944			$ 5,810.69
Balance in savings account, initiation fees			2,559.98
Balance in savings account, International Congress			1,510.06
			$ 9,880.73
Receipts:			
Dues		$26,328.00	
Exhibits, 1944 Meeting		2,567.50	
Initiation fees		3,124.06	
Interest earned		851.81	
Pamphlets, Child Health Record	$ 437.74		
Immunization Procedures	829.03		
Vitamins	12.80	1,279.57	
Subscriptions, Men in Service		707.50	34,858.44
			$44,739.17
Disbursements:			
Annual Meeting—1944		$ 3,879.40	
Bank charges and exchange		92.73	
Bonds		2,000.00	
Certificates and mounting		52.42	
Executive Board		1,518.37	
Miscellaneous		170.42	
Office supplies and equipment		279.50	
Postage		564.67	
Refunds—initiation fees		100.00	
Rent		2,227.08	
Salaries—Secretary	$6,875.00		
Assistant secretary	550.00		
Stenographer	2,045.00		
Office	1,437.22	10,907.22	
Stationery and printing		1,443.02	
Subscriptions		7,275.35	
Telephone and telegrams		370.64	
Travel expense (Secretary)		301.12	
Treasurer's bonds		92.50	
Expense—Regions	2,133.60		
States	98.90		
Committees	889.40	3,121.90	
Pamphlets, Child Health Record	304.59		
Immunization Procedures	681.47		
Vitamins	.47	986.53	35,382.87
Balance, May 31, 1945			$ 9,356.30
Balance in checking account, May 31, 1945			$ 4,120.80
Balance in savings account, initiation fees			3,698.57
Balance in savings account, International Congress			1,536.93
			$ 9,356.30

The budget suggested by the Treasurer was accepted and a wartime assessment of $5 a year was voted.

Report of Region I

The directive from Washington, that all conventions which were not directly associated with the war effort could not be held, made it necessary to postpone the meeting of Region I,

scheduled to be held in New York, March 27, 28, 29. The Committee, headed by Miner C. Hill, is held intact and all the arrangements which had been made are held in abeyance. Arrangements have been made to hold this meeting March 26, 27, 28, 1946, at the Hotel Pennsylvania, New York City. The commercial exhibitors have already expressed their desire for space which will assure its success. I wish to thank Hill and his co-workers for the tireless efforts which they made in preparing for this meeting. I am sure the one to be held next year will be of great benefit to us all.

Since we were not holding a meeting, I have attempted to stimulate Academy activities through the various State Chairmen and by meeting with Pediatric groups whenever possible. I attended the meeting of the New England Pediatric Society in Boston and met with the Fellows of New Jersey and with those in Washington. Various Academy activities were discussed and information pertaining to the activities of various committees obtained. It was extremely stimulating to meet with these Fellows and to see how they were working. The shortness of personnel has naturally curtailed many Pediatric activities throughout the Region. However, in practically all states the activities are progressing.

Since the groups in Washington are rather compact, it is natural they should lead in their various activities. All of the committees in Washington are doing exceptionally good work and I wish to commend, especially, the work done by Dr. Nichols' Committee on Cooperation with Governmental and Medical Agencies. Again, Dr. Dunham's committee takes the spotlight; they have outlined a set of Resolutions which were adopted for the care of the newborn by the Fellows of the Academy in the District of Columbia and have requested that these be published in the JOURNAL OF PEDIATRICS. They also have excellent plans for Nursery Units to be built in the two new hospitals proposed. This information was published in the May issue of the JOURNAL OF PEDIATRICS under the heading of "News and Notes."

Wharton Smith reports that the Academy work is continuing as originally outlined and gives an excellent report from Dean Roberts, Chief of the Bureau of Child Hygiene, in which it states the activities of the Bureau of Child Hygiene in Maryland. Twelve hundred and fifty clinics were held in twenty-one counties during the course of the year. The total number of new patients admitted to clinics was 12,013; the total number of visits to clinics throughout the State was 23,034.

Julian Lyon and J. A. Gilmartin make an excellent team for Pennsylvania and are using all the Fellows throughout the States for the promotion of Pediatric activities.

In New Jersey, Dr. Harrold Murray has every Fellow in the States on a committee actively engaged in Infant and Child Welfare Activities. In all, eight committees are functioning. A new committee has been formed called The Professional Opportunity and Public Relations Committee, to assist men as they return from service. All counties in the States are represented by a Fellow in that Region.

Warren Sisson of Massachusetts reports that the Fellows in Massachusetts have their fingers on all of the Child activities throughout the States and are very enthusiastic and hard workers.

This holds true for New York, Connecticut, and the other States in Region I.

It would seem from this report, I am proud of the leadership the Fellows of the Academy have shown—not only in child welfare activities but also in all matters for the betterment of mankind.

OLIVER L. STRINGFIELD
Chairman, Region I

Report of Region II

Region II, which comprises the Southern States, has probably been hit harder by the war due to the fact that so many large army camps are located in this section. This has brought great numbers of soldiers' families. Housing has been taxed beyond its capacity, and many families have been forced to live in places unfit for habitation. This has brought greatest hardship on the children.

Reports from the various states indicate that the pediatricians are carrying on in traditional manner. In most of the states no state meetings have been held and no organized activity has taken place. The pediatricians have in most places had more work than they

could possibly do and have not had time to go to meetings or read papers. The pediatricians of Texas have held two important meetings during the past year. One was a splendid two-day session at Galveston, at which Dr. Irvine McQuarrie was the guest speaker. The other meeting was arranged by Dr. John Ashby, chairman of the Committee on Contact with Nonmedical Groups. At this meeting special stress was laid on psychiatric aspects of pediatric problems and guest speakers were Dr. James S. Plant, Director of the Essex County Juvenile Clinic of Newark, N. J., and Dr. Milton Kirkpatrick, Director of the Guidance Center of New Orleans.

Probably the most effective work outside of private practice has been where the pediatricians have taken advantage of the State Board of Health setup. In these states the machinery of the State Boards of Health has been found very cooperative and efficient in arranging pediatric clinics and lectures to laymen and, in general, furthering the public health aspects of pediatrics. This close cooperation between the Academy and the State Boards of Health has been particularly true in Kentucky and Georgia.

Many State Chairmen expressed the same feeling about the EMIC program, that is, there is much paper work for the money received. They would rather treat the children of the soldiers for nothing and let the paper work go. They all feel that the EMIC program should stop as soon as the war is over.

JAMES W. BRUCE
Associate Chairman, Region II

Report of Region III

At the St. Louis meeting last November the State Chairmen of Region III voted to hold a meeting this Spring limited to State Chairmen for the purpose of discussing non-scientific problems of the Region. The ruling of the Office of Defense Transportation forced its cancellation.

Letters were sent to all State Chairmen in April advising them of the meeting of the Executive Board in June, and, while no report of Academy activities in their respective states was requested, each was asked to submit any matters they wished to have placed before the Board. Replies were received from Illinois, Minnesota, Missouri, South Dakota, and Wisconsin. No specific matter for submission to the Board was contained in any of these communications. Several referred to minor local difficulties with the EMIC program, but in general it seemed to be accepted that it was working as well as it could. More concern was expressed about postwar plans the Children's Bureau apparently is leading up to as revealed in some of its recent publications. One communication found it difficult to reconcile the views expressed at the St. Louis meeting with the "Recommendations for Expansion of Maternal and Child-Health Services" as published in the March 3 issue of *The Journal of the American Medical Association.*

How is the Academy to correlate its proposed survey with this potential postwar program of the Children's Bureau?

The Chairman of Region III would recommend to the Executive Board of the Academy of Pediatrics that a meeting of all State Chairmen and of all officers of the Academy be called at the earliest possible time that permission of the Office of Defense Transportation can be obtained for the specific purpose of studying in detail the various proposals of the Children's Bureau and of adopting the atttiude it is felt should be recommended the Academy take in respect to them.

LEE FORREST HILL
Chairman, Region III
GEORGE MUNNS
Associate Chairman, Region III

Report of Region IV

The last regional meeting of Region IV was held in San Francisco in May, 1941. At present it seems extremely improbable that regional meetings can be resumed before 1947. A considerable proportion of Region IV membership is in military service. The remaining membership is swamped with practice.

At the June meeting of the Executive Board nine candidates are being presented for Academy membership. With the end of the war, it is believed that Region IV will acquire many new pediatricians, some by change of location and others after completion of special postwar training to qualify them as pediatricians.

Respectfully submitted,
HUGH K. BERKLEY
Chairman, Region IV

Reports of Committees

Report of the Committee on Post-War Planning

The following report is one of progress and dates from a meeting of some of the committee in New York on March 31, 1945. At that meeting, your present chairman was appointed. The committee regretted greatly that Dr. Helmholz felt it was inadvisable for him to pilot further the project which he had launched so adroitly. The plan with the objective as outlined in the preamble of the original report, the Academy is not crusading. We are, however, motivated by a challenge in medical care. We look upon the idea of the wider distribution of better medical care as an expedient plan in our American way of living. We think we are familiar with a form of medical care for children that is better than is commonly enjoyed by the American people. Just as it is expedient for all the citizens of a community to have a supply of pure water, so it is expedient for us to distribute medical care equitably. It is the challenge and the expediency of the project that make its especial appeal.

Prior to Dr. Helmholz' resignation, considerable effort had been made by Dr. Wall to secure a suitable person as an executive secretary for the committee. It was felt that the position demanded unusual qualifications and it was hoped that some member of the Academy would be available to take on this full-time position. The war undoubtedly, with its demands for medical personnel, has made the selection of a professionally trained person more difficult. At the onset, we seriously considered a nonprofessional person, but it was later felt that the person selected should be very familiar with all government agencies and able particularly to cooperate with the United States Public Health Service and the Children's Bureau, which are participating in the study. The final selection of the executive secretary has not been made. However, we are still considering candidates and hope to be able to make a selection in the near future. The progress of the study rests in no small measure upon the judicious and prompt selection of an executive secretary.

In the study of the organization of our work, we naturally became greatly interested in the hospital survey now being made under the auspices of the Commission on Hospital Care. Through the efforts of the secretary of the Academy, an interview was arranged in Chicago with Dr. A. C. Bachmeyer, who is the Director of Study for the Commission on Hospital Care, and who, incidentally, is spending one-half of his time on this project. Dr. Grulee and I were greatly impressed by the scope of the hospital project, its organization, its plan of study, and its financial backing. Dr. Bachmeyer was most interested in our plan and was very willing to cooperate in any way possible. It seems more than likely that we will be able to utilize some of the material acquired in their study in our own survey. The hospital survey has already been launched and an intense study of one state, namely Michigan, has been partially made. Dr. Helmholz has seen Dr. Bachmeyer more recently and was able to obtain a preliminary report of some of the data that had already been processed. The hospital study should be very helpful to us as an example of an investigation for better medical care.

The next activity of the committee involved conferences with Dr. Thomas Parran, Surgeon General of the U. S. Public Health Service, and Dr. Martha M. Eliot of the Children's Bureau, in order to secure their interest and cooperation in our survey. Dr. Allan M. Butler, a member of the committee, and I met Dr. Parran in Boston. We presented the plans of the Academy and asked for the cooperation of the United States Public Health Service. Dr. Parran from the very beginning was most interested and arranged for a meeting between members of his department and our committee. Dr. Eliot, a member of the Academy, and Assistant Chief of the Children's Bureau, has also been most anxious to participate in this study and has shown evidence of unquestionable willingness to assist in every way possible. On May 2, Dr. Allan Butler and Dr. Wall of our committee met

with Dr. Parran, Dr. Dean Clark, Mr. Perrott, of the United States Public Health Service, and with Dr. Van Horn and Mr. Schwartz of the Children's Bureau. Dr. Wall reported that the conference was most encouraging and that Dr. Parran had directed Mr. Perrott of his department to have a conference of certain members of the Public Health Service with a view to selecting a man to help in our work. At that meeting, Dr. Butler and Dr. Wall discussed the question of paying for the services of personnel from the Public Health Service from our funds, but Dr. Parran said that there would be no difficulty and that it might be better to carry the person loaned to this study on the budget of their own department. Dr. Parran also brought up the possibility of securing additional funds from other foundations, and Dr. Wall was much encouraged to know that it was Dr. Parran's belief that we might obtain additional support.

On June 9 a further meeting of the committee was called in Washington to meet with representatives from the Children's Bureau and the United States Public Health Service, who had been assigned to the survey. At this meeting the following were present: Dr. Wall, Dr. Helmholz, Dr. Linde, and myself, representing the Academy; Dr. Martha Eliot, Dr. Katherine Bain, and Mr. Schwartz, from the Children's Bureau; Mr. Perrott, Mr. Britten, Dr. Clark, and Dr. Williams, representing the Public Health Service. The meeting was held at the invitation of Dr. Wall at the Children's Hospital, where he has arranged to have a room set aside for permanent headquarters of the committee. It was felt, and I think very wisely, that from the beginning we should consider this study as one initiated by a group of physicians and not by the Government. The committee owes a sense of gratitude to the hospitality of Dr. Wall and the staff of the Children's Hospital. They not only provided space for the meeting but also entertained us all at a luncheon which we shall always remember. Dr. Bain of the Children's Bureau and Dr. Williams of the Public Health Service have been assigned to us from their respective departments for full-time participation in our project. Dr. Wall made a few preliminary remarks at the meeting, emphasizing the relative position of the three participating groups in this survey. He made it most explicit that this was an Academy project and that we, the representatives of the Academy, were in his phrase "carrying the ball." This understanding was most acceptable to the representatives of the Federal departments, as it was felt that the results of the study would have a greater influence under this plan. During the meeting we discussed the question of the final results of the survey and it was generally agreed that the facts should receive full publicity and should be published as a joint report from the three participating groups. It was felt that the interpretation of the results would not be controversial, but it would be the privilege of each group to make an individual interpretation.

The Committee had previously designated Dr. Helmholz, Dr. Wall, and the chairman as a steering group for the Committee of Nine. The size of the committee and its geographical distribution make it impossible for full meetings of its membership. At the Washington meeting, it was felt that there should be a committee made up from Washington members to act in an advisory capacity in outlining the work from time to time. Dr. Wall from the Academy, Mr. Perrott from the United States Public Health Service, and Dr. Eliot from the Children's Bureau were selected for this committee. In addition to this, it was felt that we should have a so-called working committee, also located in Washington. The following were selected to serve on this committee: Dr. Bain from the Children's Bureau, Dr. Williams from the United States Public Health Service, and the executive secretary (to be selected) to represent the Academy.

The next subject for discussion was the scope of the project and the allocation of the studies to the various members of the working group. Dr. Bain had arranged an agenda, (*Exhibit A*), a copy of which follows this report. It was felt that it would be impossible to allocate various subjects to either bureau or the Academy, but in general the study should be taken up by all members of the working committee. After a rather prolonged discussion which lasted until midafternoon, various topics on the agenda were discussed and many important suggestions were made by various representatives from the two Federal bureaus and the Academy which will enable the working committee to formulate schedules for the survey. The agenda was accepted as a whole with the understanding that we would not investigate institutions for the deaf and the blind. It was the consensus of the members of the group that frequent meetings should be held and that progress reports should be made from time to time. It was agreed by the group that an intense study of one state should be made in a manner similar to the hospital study, which has used Michigan as a pilot study. There seemed to be a great deal of question as to what state should be selected, and the

final decision was left to members of the working committee. It was agreed by all at the meeting that the success of the survey depended largely upon the ability of the members of the Academy to participate actively in the study. It was felt that answers to many of the schedules of investigation with questionnaires could be obtained only through the participation of practicing physicians. Finally, it was the consensus of the group that the study should be pursued as soon as possible and it was hoped that the work of the committee would be under way by early fall. The members of the Federal groups who had had experience in such studies felt that it would take at least six months for the intense state study of medical care and that the survey of the facilities in all the states would take at least a year.

The committee appreciates that we have undertaken a survey which may have profound implications upon future medical care. They feel most hopeful in undertaking this study because of the unequivocal cooperation of the United States Public Health Service and the Children's Bureau.

Respectfully submitted,
WARREN R. SISSON, Chairman

ALLAN M. BUTLER
HARVEY F. GARRISON
HENRY F. HELMHOLZ
LEE FORREST HILL
JOSEPH I. LINDE
BORDEN S. VEEDER
JOSEPH S. WALL
JAMES L. WILSON

This report was accepted.

EXHIBIT A

AMERICAN ACADEMY OF PEDIATRICS SURVEY

Items to be considered for inclusion in study:

I. *Personnel*

A. Facilities

1. Study of the medical schools in the State, to include quantity and quality of training in pediatrics for
   a. Undergraduate
   b. Interne and resident training
   c. Postgraduate for general practitioners and others

   This might be undertaken as part of this study, or as a joint activity with some other group, as the Council on Medical Education, or as an activity of another committee of the Academy. It should include data on staff, curricula, number of pediatric beds available for teaching, and opportunity for studying pediatric specialties, as allergy, rheumatic fever, mental hygiene, etc.
2. Number of physicians in the State who have received postgraduate training in pediatrics; amount
3. Provision by State health department or other agency for financing postgraduate or refresher courses
4. Provision for postgraduate training for nurses in pediatric nursing and in special pediatric fields, as care of premature, rheumatic fever, etc.

B. Distribution of personnel

1. Pediatricians; number of diplomates and nondiplomates; map showing distribution
2. General practitioners; number; map showing distribution
   Access of physicians to general hospital
   Access of physicians to hospital with pediatric unit
3. Estimate of quantity of time devoted by general practitioner to children
   Number of families carried
   Amount of time devoted to health supervision
   Amount of time devoted to sick children
   Availability and use of consultant service
4. Number of specialists (a) surgeons (diplomates of boards), (b) eye, ear, nose, and throat, (c) allergists, (d) cardiologists, (e) psychiatrists, competent to deal with special problems of pediatrics; map

C. Load per pediatrician

1. Number of families carried

2. Number of cases seen per month { Home / Office / Hospital / Consultation }

3. Amount of care given per child per year
   0—1 year
   1—6 years
   6—14 years

II. *Facilities*

A. Hospitals

1. Data from Commission on hospital care
   a. Children's hospitals
   b. General hospitals with separate wards for children
   c. General hospitals without separate wards for children
   d. Special, as tuberculosis, convalescent

2. Additional data to amplify item 1

B. Outpatient clinics, if not under A1 and 2

C. Laboratory facilities

III. *Services*

A. Child Health Conferences
   Number; auspices; staff; patients served; eligibility; age; type of service; quality of service; payment of personnel

B. School Health Services
   Auspices; staff; content of program; supervision of personnel; payment of personnel

C. Medical Care Programs; public and private

D. Child Guidance Services

E. Public Health Nursing

Report of the Committee on Post-War Courses in Pediatrics*

This special committee was appointed to make a comprehensive study of the facilities available in the United States and Canada for graduate and postgraduate training in pediatrics. The information sought is essential to the Academy's program of offering assistance to its own members in the Armed Services and to other medical officers who may desire further training in this field following their discharge from military duty.

The first task of the Committee was to ascertain the number of medical veterans who are likely to seek such training. Preliminary polls of the Academy members in the various Armed Services did not prove to be very helpful. However, the information needed was supplied through the courtesy of Lieutenant-Colonel H. C. Lueth, who had just completed an extensive study of 21,029 questionnaires returned from medical officers of the United States Army, Navy, Public Health Service, and the Veterans Administration, whom he had polled regarding their postwar wishes. This number represents somewhat fewer than one-third of the total number of medical officers in the services of the United States and Canada.

On the basis of this poll, it is estimated that a total of between 2,200 and 2,400 discharged medical officers now in service in the two countries will want further training in pediatrics before entering civilian practice. About one-third of these, mostly older officers who were previously in practice, will want short courses lasting from three to six months. The remaining two-thirds, according to their expressed desire, will want long courses. The majority of these will want two or three years of additional training. The others, many of whom had internships and residences before entering the services, will want from six to eighteen months. More than four-fifths of the entire long course group and nearly one-half of the short course group expressed a wish to prepare for certification by the American Board of Pediatrics.

It has been impossible to obtain reliable information regarding the rate at which medical officers will be released to civilian life. Some may be retained in service for a considerable period of time after the war. If those who are to be discharged are mustered out

*Dr. McQuarrie was present and discussed at length the various phases of this report.

at a reasonably uniform rate over a period of three years, there will probably be an average of 600 to 700 seeking training opportunities annually for about three years. These would be distributed between four groups approximately as follows: (1) those wanting refresher or short courses; (2) those wanting one year; (3) those wanting two years; and, (4) those wanting three years or more.

A comprehensive questionnaire was prepared and sent to the heads of departments of pediatrics in the leading medical schools and children's hospitals in the United States and Canada. The questionnaire called for data regarding the regular prewar training facilities in these institutions and also the possibilities for creating additional opportunities by better utilization of all facilities in these and affiliated institutions. By arranging suitable rotations through various outpatient clinics, laboratories, and hospital services dealing with all phases of pediatric practice, a considerable number of extra training positions of acceptable quality could undoubtedly be made available.

Approximate estimates based upon information contained in 44 questionnaires returned to date (56% of total sent out) indicate that the total number of training positions already available to meet ordinary peacetime demands are distributed as follows: full-time internships, 180; rotating internships, 155; assistant residencies, 225; residencies, 97; teaching assistantships, 55; research fellowships, 59; and full-time instructorships, 97. Presumably all of these provide maintenance or a stipend or both. Because of the wartime quota restrictions and the scarcity of candidates, approximately one-third of these positions can be assumed to be vacant at the present time. In addition to these vacancies, the numbers of extra positions of standard quality which could be created by proper use of existing training facilities in the institutions polled are estimated to be as follows: full-time internships, 104; assistant residentships, 166; residentships, 116; teaching assistantships, 138; research fellowships, 124; and full-time instructorships, 100, or a total of 648 new positions. It is obvious from inspection of the returned questionnaires that these figures represent an underestimation rather than exaggeration of the potentialities. There remain in addition to these potential positions, numerous others in excellent hospital services which have not been included in the present study.

While some of the potential positions referred to would provide maintenance or a stipend, many of them would not. This means that the candidate would be required to maintain himself or make use of the provisions of the G. I. Bill for this purpose.

The full-time positions we have listed would satisfy the needs of physicians requiring long courses of training. For the remaining one-third (probably numbering between 200 and 275 officers per year), special refresher courses would have to be organized or special arrangements would need to be made with individual clinics for the type of work desired. At least eight pediatric teaching centers have already had experience in conducting organized postgraduate courses of one or two weeks' duration for between 20 and 50 persons at a time. Some of these centers could probably be called upon to offer such courses again with extention of the time and expansion of the content of the course. The investigation of the Committee is still in progress.

The tentative conclusion to be drawn from this preliminary survey is that a sufficient number of opportunities for training in pediatrics can be provided for our returning medical veterans if a suitable mechanism can be devised for bringing candidates and positions together.

IRVINE MCQUARRIE, Chairman

HAROLD K. FABER
STANLEY GIBSON
ALTON GOLDBLOOM
ARILD E. HANSEN
JOSEPH A. JOHNSTON
RUSTIN MCINTOSH

This report was accepted.

Report of the Committee on Pan-American Scholarships*

Dr. Helmholz stated that there was great difficulty for the men from Latin-American countries to learn to speak the English language with sufficient fluency so that they could carry on clinical work in this country. The Secretary concurred and said that this was only one of the difficulties, and that there were several more: that the adjustment of the scholars,

*This report was given by Dr. Helmholz, personally.

the schools, and the organization supplying the fund was frequently a hard one to make. He submitted the following list of scholars:

SINCE MEETING NOVEMBER, 1944

Assignment of Scholarships (16)

1944

Nov.	Kellogg Foundation	Ramiro Arcía (Nicaragua)	University of Pennsylvania
Nov.	Kellogg Foundation	Paulo França (Brazil)	State University of Iowa
Dec.	Kellogg Foundation	Guillermo Bunge (Argentina)	University of California

1945

Jan.	Wyeth Corporation (S. M. A.)	Miguel Raga (Venezuela)	Harvard University
Feb.	Kellogg Foundation	Francisco Miranda (Venezuela)	University of Chicago
Feb.	Kellogg Foundation	Alberto Córdova (Cuba)	Duke University
Feb.	McKesson and Robbins Dietetics Laboratory	Hermelinda C. de Varela (Panama)	Johns Hopkins University
Mar.	Kellogg Foundation	Maria I. Escobar (Guatemala)	Bellevue Hospital, N. Y.
Mar.	Kellogg Foundation	Beatriz Bienvenu (Mexico)	Harvard University
Apr.	Kellogg Foundation	Alberto Peguero (Dominican Republic)	University of Rochester, N. Y.
May	Kellogg Foundation	Rubén Lavalle (Mexico)	Western Reserve University
May	Kellogg Foundation	Felipe Cacho (Mexico)	Harvard University
June	Kellogg Foundation	*Alfonso Cárdenas (Colombia)	Harvard University
July	Kellogg Foundation	Manuel Jovel (El Salvador)	University of Toronto
July	McKesson and Robbins Dietetics Laboratory	Fernando Leyva (Cuba)	University of Minnesota
July	Kellogg Foundation	Abel Medina (Nicaragua)	Johns Hopkins University

Pending (2)

		Rubén Buzzo (Argentina)	
		Alfonso Vargas (Colombia)	

Termination of Scholarships (9)

1944

Nov.	Wyeth Corporation (S. M. A.)	Miguel Barreto (Colombia)	University of Rochester
Dec.	Kellogg Foundation	Alejandro Rodríguez (Venezuela)	Johns Hopkins University
Dec.	Kellogg Foundation	Guillermo Bunge (Argentina)	University of Chicago

1945

Apr.	Kellogg Foundation	Jaime Jaramillo (Colombia)	Tulane University
Apr.	Kellogg Foundation	Gustavo Castañeda (Guatemala)	University of Minnesota
Apr.	McKesson and Robbins Dietetics Laboratory	Hermelinda C. de Varela (Panama)	Johns Hopkins University
June	Kellogg Foundation	*Alfonso Cárdenas (Colombia)	University of Michigan
Aug.	Mead Johnson & Co.	Eduardo Cassorla (Mexico)	University of Illinois
Aug.	Kellogg Foundation	Ramón Sanz (Mexico)	Children's Memorial Hospital, Chicago, Ill.

*Transferred from University of Michigan to Harvard University for final four months of one-year scholarship.

Report of the Committee on Rheumatic Fever*

The Committee on Rheumatic Fever has had no meeting since the Annual Meeting of the Academy in St. Louis last November, 1944. However, since that time and since the symposium on Rheumatic Fever at that meeting which was published in the JOURNAL, some States have sought the help of the Academy through our Committee in the planning of a State program as in New Jersey. Virginia has requested help in the evaluation of their results of their five-year program. Pennsylvania has asked for help in the setting up of a program and is planning to put into the hands of their personnel in the Department of Health the published symposium of the St. Louis meeting.

Copies of "British Recommendations with Regard to Children With Rheumatic Fever" and copies of the proceedings of the Conference on Rheumatic Fever held under the auspices of the Children's Bureau in October, 1943, are to be sent out to the Fellows, as far as the supply permits.

A questionnaire was sent out to each State Chairman. This has given the Committee pertinent information regarding rheumatic fever programs in the various States, and the activity and interest of the Fellows in this disease and public health problem.

On May 8, 1945, a second meeting of the American Council on Rheumatic Fever was held in New York City, at which various professional and lay groups were represented. Dr. Hugh McCulloch was elected Vice-Chairman of this body. Definite objectives were mapped out and each constituent organization will be asked to participate and take an active part.

Respectfully submitted,
ALEXANDER T. MARTIN, Chairman

STANLEY GIBSON
JOHN P. HUBBARD, (Lieutenant Colonel, United States Army)
HUGH MCCULLOCH
EUGENE H. SMITH
R. R. STRUTHERS (Lieutenant Colonel, Canadian Army)
GEORGE M. WHEATLEY

This report was accepted.

Report of the Committee on Geographical Distribution of Pediatricians

The report of the Committee on Geographical Distribution of Pediatricians, of which Dr. Goehle is Chairman, was accepted with our "heart-felt gratitude." This report showed a tremendous amount of work on the distribution of pediatricians in this country, and may be of a great deal of help to the Committee on Postwar Planning. This was simply a report of progress. Part of the report has been photostated and sent to the State Chairman.

Report of the Committee on National Defense

There have been no new developments in connection with the Committee on National Defense. From time to time, a few children entered this country, and they have been examined and placed, as in the past. The number arriving to the attention of the Committee has been very small since my last report.

CARL H. SMITH, Chairman

ROBERT A. BIER
CARL H. LAWS
RUSTIN MCINTOSH
DOUGLAS D. MARTIN
LENDON SNEDEKER
PHILIP M. STIMSON
JOSEPH STOKES, JR.

This report was accepted.

MEETING ADJOURNED.

MEETING CALLED TO ORDER AT 8 P.M., FRIDAY, JUNE 15.

Report of the Committee on Cooperation With the American Legion

The following members of the Academy have been appointed by the President to serve on the committee and as liaison officers with the Legion Area Child Welfare Chairmen:

Dr. Edwin T. Wyman, Boston, Academy Region I, to serve also as Liaison Officer with Legion Area A Child Welfare Division.

*Presented personally by Dr. McCulloch.

Dr. Preston A. McLendon, Washington, Academy Region I, to serve also as Liaison Officers with Legion Area B Child Welfare Division.

Dr. George M. Lyon, Huntington, W. Va., Academy Region II, to serve also as Liaison Officer with Legion Area C Child Welfare Division.

Dr. Julius H. Hess, Chicago, Academy Region III, to serve also as Liaison Officer with Legion Area D Child Welfare Division.

Dr. Clifford Sweet, Oakland, Calif., Academy Region IV, to serve also as Liaison Officer with Legion Area E Child Welfare Division.

The President has also appointed a member of the Academy in each State to serve as Liaison Officer with the Legion Department Child Welfare Chairman.

There are 134 members of the Academy who are also members of the Legion. This number will be increased as liaison work with the Legion develops and as members who are in military service are discharged and become eligible for membership in the Legion. This is an important group and should be cultivated for liaison activities with the Legion.

A statement outlining briefly the present situation—the relation of the Academy to the Legion and suggesting plans for the future has been sent to all Region and State Chairmen and to Region and State Liaison Officers.

The Chief Liaison Officer and Chairman of the Committee has attended several conferences with Miss Puschner, the director of the Legion National Child Welfare Division, and two meetings of the Executive Committee of the Child Welfare Division at Indianapolis. On November 27, 1944, the organization of the Academy was explained to the Legion Committee and a statement was made on what could be accomplished in the field of Child Welfare by the combined efforts of the two groups. On April 6, 1945, the following resolution was adopted:

"Action of the American Legion National Child Welfare Executive Committee at its meeting at the National Headquarters of the American Legion, Indianapolis, Indiana, Friday, April 6, 1945.

"WHEREAS, The American Legion and the American Legion Auxiliary having established the month of April in each year as Child Welfare Month, and

"WHEREAS, This being for the purpose of expending and intensifying the child welfare activities, and

"WHEREAS, The American Legion and the American Legion Auxiliary having become closely associated with the American Academy of Pediatrics, because of mutual child welfare interests and activities; now, therefore,

"BE IT RESOLVED, That the American Legion National Child Welfare Executive Committee urges upon all Posts of the American Legion and all Units of the American Legion Auxiliary that they strengthen their efforts in child welfare to make April truly 'Child Welfare Month,' and

"BE IT FURTHER RESOLVED, That the American Academy of Pediatrics be urged to establish April as Child Welfare Month for the intensification and strengthening of their child welfare activities, and that these organizations, wherever possible, join their efforts and lend mutual cooperation to each other in the interest of the child health of the nation."

The Chief Liaison Officer also attended the annual Legion Area D Child Welfare-School Conference in St. Louis on Jan. 26, 1945, to observe the plan of operation of such meetings and the part where the Academy might be useful in future meetings.

No meeting of the Committee nor State Liaison Officers has been held. It is planned to hold a meeting of the Committee as soon as possible to discuss aims and objectives for the development of liaison work with the Legion. A tentative outline has already been drawn up and has been approved by the Committee. This outline and statement will be completed and distributed later.

The following recommendations are submitted by the Committee:

1. That the Academy render support to the Legion "April—Child Welfare Month" program by being available for advice in the planning of activities for the month

of April; in assisting in those activities and in cooperating with the Legion to bring effective and sustained accomplishment in the months that follow the April observance.

2. That the several National Committees both standing and special of the Academy be urged to make reciprocal plans for these special activities. Many mutual advantages can result in the respective fields of legislation, publicity, child health, and child welfare programs.

3. That the Academy cooperate with the Legion through the Committee on a Consideration of Child Health in the Postwar Period, planning with the Legion to bring about more satisfactory and desirable conditions in the field of child health and welfare.

4. That conferences be held at annual meetings of the Academy by the Committee on Cooperation with the Legion and state liaison officers with representatives of the Legion; that similar conferences be held at the annual meeting of the several regions of the Academy and state liaison officers with representatives of the American Legion Child Welfare Areas; that members of the Academy Committee on Cooperation be urged to attend meetings of the Child Welfare Committee at the National American Legion Convention, and National Child Welfare Conferences, and the Legion Area Child Welfare Conferences to all of which members of the Academy are most cordially invited by the Legion; that qualified representatives of the Legion be invited to attend respective meetings of the Academy.

5. That means for satisfactory orientation on all activities of the Committee and the Legion be set up for the benefit of the Academy, the Executive Board of the Academy, the Regional Chairmen, State Chairmen, and the various Liaison Officers at similar levels in order that complete coordination be attained.

6. That the Secretary-Treasurer of the Academy be empowered to expend funds necessary for essential expenses in carrying out these recommendations.

7. That the Academy give consideration to plans for the guidance and rehabilitation of children, and also veterans under age twenty-one discharged from military service; that special consideration be given the education of medical officers who are in need of or who request further medical training and education in the field of pediatrics.

The Executive Board voted to approve recommendation Numbers 1, 2, and 3; Number 4 was altered to read, "The Academy specially recommends that conferences be held, etc.," and was approved in this way; No. 5 was approved; No. 6 was approved with a provision that the amount the Secretary-Treasurer of the Academy was empowered to expend did not exceed $250; No. 7 was approved with the provision that the words, "and also veterans under age twenty-one discharged from military service," be deleted. The report was then accepted and Dr. McCulloch was thanked for his excellent service.

Report of the Committee on Contact Infections

At the request of the Committee on Therapeutic Procedure for Acute Infectious Diseases and on Biologicals, this committee has considered a report from Hartford, Conn., on tuberculin testing and x-ray of preschool children and their families. Although no cases of active tuberculosis were found it was thought that this work is of sufficient educational value to be worth continuing.

The Committee has cooperated with the National Tuberculosis Association in editing a recently published booklet, "Your Baby." This is an excellent, simple, and concise leaflet recommending to parents methods for prevention and tuberculosis and other infections in children. It is expected that this will be widely distributed to families with newly born infants.

Respectfully submitted,
FAIRFAX HALL, Chairman

GAYLORD W. GRAVES — CHESTER A. STEWART
REGINALD A. HIGGONS — PARK J. WHITE

This report was accepted.

Report of the Committee on Cooperation With Nonmedical Groups

The Committee has prepared a health card for camp examinations. The card was designed at the request of the Girl Scouts, American Camping Association, and other groups. It includes space for the health history, physical examination, and health record while in camp. It was printed through the courtesy of the Mead Johnson and Company and will be

FORM SP-511 COPYR., 1945, AMERICAN ACADEMY OF PEDIATRICS

STANDARD HEALTH EXAMINATION RECORD
(THIS PART TO BE FILLED IN BY PARENT)

ORGANIZATION OR SCHOOL

NAME (LAST, FIRST) PARENT OR GUARDIAN PHONE

ADDRESS AGE SEX DATE OF BIRTH RACE

PAST ILLNESSES: (CHECK—GIVING YEAR OR DATES)		DISEASES (DATE)	IMMUNIZATIONS TESTS (DATE)	
FREQUENT COLDS	STOMACH UPSETS	CHICKENPOX	DIPHTHERIA	TETANUS TOX.
FREQUENT SORE THROATS	KIDNEY TROUBLE	MEASLES	SMALLPOX	TUBERCULIN
SINUS	HEART TROUBLE	MUMPS	TYPHOID	SCHICK
ABSCESSED EARS	RHEUMATIC FEVER	SCARLET FEVER	WHOOPING COUGH	
BRONCHITIS	CONVULSIONS	POLIOMYELITIS	PREVIOUS INJECTIONS OF HORSE SERUM	
ANY LUNG TROUBLE	TUBERCULOSIS	WHOOPING COUGH	RECENT EXPOSURE TO CONTAGIOUS DISEASE	
ALLERGIES	DIABETIC			

OPERATIONS

OTHER DISEASES OR DETAILS

BEHAVIOR SLEEP WALKING BED WETTING NIGHT TERRORS

APPETITE FOOD DISLIKES BOWELS FAINTING

PARENT'S REPORT REGARDING PHYSICIAN'S RECOMMENDATIONS DATE

Fig. 1.—Obverse side.

STANDARD PHYSICAL EXAMINATIONS
(BY LICENSED M. D.)

CODE: V—IF SATISFACTORY W—IF NEEDS WATCHING C—IF NEEDS CORRECTING

CHECK V, W OR C	DATE	WT.	HT.	DATE	WT.	HT.
GENERAL CONDITION OR APPRAISAL						
POSTURE						
FEET AND SPINE						
SKIN SCABIES, ATHLETES FOOT, IMPETIGO						
EYES VISION, DISCHARGE						
EARS HEARING, DISCHARGE						
NOSE BLEEDS, DISCHARGE						
THROAT TONSILS						
TEETH NUMBER, CARIES						
HEART MURMUR						
BLOOD PRESSURE SYS. DIAS.						
LUNGS						
ABDOMEN HERNIA						
MENSTRUATION						
URINE						
BLOOD HEMOG.						
ADDITIONAL DATA						
PARENT PRESENT?						
EXAMINER'S SIG.						

PHYSICIAN'S REPORT AFTER EXAMINATION

COMMENTS

RECOMMENDATIONS

HEALTH RECORD DURING CAMP OR SCHOOL

COMMENTS

TREATMENTS

NOTE ANY PHYSICAL INJURY OR CONDITION WHICH HAS DEVELOPED IN CAMP OR SCHOOL TO WHICH PARENT'S ATTENTION SHOULD BE DIRECTED.

IMPORTANT—USE ADDITIONAL CARD IF NECESSARY.

Fig. 2.—Reverse side.

made available at a moderate cost to interested groups and be distributed free of charge to physicians who request the cards. Already over one hundred thousand have been ordered for use this summer. The Committee hopes it will encourage periodic physical examinations and prepare the way for closer relationship with children's organizations.

ALBERT D. KAISER, Chairman

ROGER L. J. KENNEDY
MARVIN ISRAEL
JOSEPH I. LINDE
MARGARET NICHOLSON
JAMES C. OVERALL
WARREN R. SISSON
LILLIAN R. SMITH
EDWIN T. WYMAN

This report was accepted.

Report of the Committee on School Health

The members of the Committee on School Health have all been active in state or national agencies concerned with school health programs. Dr. George M. Wheatley gave considerable aid to the United States Children's Bureau in the planning of a school health unit for the Bureau, working with a committee representing the United States Public Health Service, the United States Office of Education, the United States Children's Bureau and the Department of Agriculture to develop a formula for cooperation between these federal agencies interested in school health programs.

Your Committee has contributed to the planning and has been represented on several Committees organized by the "National Conference for Cooperation in Health Education." This agency, which has a broad representation from many national groups, aims to bridge the gaps between the professions of education and medicine and the official and nonofficial public health agencies. This includes the revision of the report "Suggested School Health Policies" and conferences on the professional preparation of nurses, physicians, and administrators concerned with school health.

Academy State Chairman and school health committees of five Western states have been invited to attend a series of seven meetings of local branches of the American Public Health Association, where school health and rheumatic fever problems are to be discussed by Dr. Wheatley between May 16 and June 1.

Academy Fellows have given notable leadership in the state of Washington in emphasizing the contribution of the teacher and nurse in selecting the children most likely to be in need of medical care. Other contributions have been made through county and state medical societies, which has led to favorable action and leadership on local programs.

HAROLD H. MITCHELL, Chairman

ROCKWELL M. KEMPTON
A. CLEMENT SILVERMAN
ARTHUR E. WADE
ESTELLE F. WARNER
GEORGE M. WHEATLEY

This report was accepted.

Report of the Committee on Immunization and Therapeutic Procedures for Acute Infectious Diseases

The Secretary reported the wide sale of the pamphlet entitled, "Report of the Committee on Therapeutic Procedures for Acute Infectious Diseases and on Biologicals of the American Academy of Pediatrics."

Report of the Committee on Mental Health

The motion picture on mental growth is ready for production, but neither the Producers nor the members of the Committee have the time to finish it at present.

Respectfully submitted,
BERT I. BEVERLY, Chairman

C. ANDERSON ALDRICH
FREDERICK H. ALLEN
BRONSON CROTHERS
GEORGE J. MOHR
ARTHUR H. PARMELEE
VICTOR E. STORK

This report was accepted.

The Secretary read a letter from Dr. Meldrum K. Wylder, requesting investigation of the feasibility of establishing Life Memberships. This was referred to a committee of one, consisting of Dr. Wylder, who was asked to report back.

It was voted to subscribe to the Child Welfare Information Service, Inc., in Washington, the amount of $25.

After some discussion regarding the term of service of State Chairmen, it was voted that we recommend to the members that the word "*annually*" be inserted after the word "President" in Section 4, Article III of the By-Laws; and in the same section, page 12, top line, a *comma* after "Regional Chairmen."

The question of State Chairmen's expenses was discussed, but no action was taken.

The question of the change in entrance requirements was discussed at length, but no definite action was taken.

MEETING ADJOURNED.

MEETING CALLED TO ORDER AT 9 A.M., SATURDAY MORNING, JUNE 16.

Report of Region V*

Dr. Hurtado reported in detail his contacts with the Latin-American groups in the various countries. He was unable to go to Argentina. The President expressed his appreciation, and that of the Academy, for Dr. Hurtado's report, and likewise for his presence at the meeting of the Executive Board. The following report was discussed at length by the members of the Executive Board, together with Dr. Hurtado and Dr. Luiz Barbosa, of Brazil, who was asked to be present:

1. I believe that it is much better that Region V be designated "The Latin-American Division."

2. That this Division shall be constituted by the membership from all the countries where branches of the American Academy of Pediatrics have been, or shall be, established.

3. That each of these countries shall pay $100 over and above the personal quota of $20 per year.

4. That for the early organization, the Executive Committee of the Academy shall choose a General Chairman from a list of two names offered by each one of the Latin groups, this chairman to be a member of the Executive Board for a period of two years.

5. Each country of this Region shall have its own Chairman.

6. This chairman shall be elected every two years by the members of the Academy in the respective countries.

7. The Chairman of Region V (Latin-American Division) shall attend the business meetings of the Executive Board and report for the Latin-American group.

8. The Latin-American group feels that a special committee should be appointed for the development of a special convention, to be known as "The Convention of Victory," such convention to meet in Chicago.

9. Special agenda should be prepared for this meeting.

At the suggestion of the Secretary, the following recommendations were proposed:

1. *Organization.*—That a temporary organization be set up in Region V, consisting of one Regional Chairman and two Associate Chairmen to represent Division "A," consisting of Argentina, Brazil, Chile, and Uruguay; and Division "B," consisting of Colombia, Costa Rica, Cuba, Republica Dominicana, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, and Venezuela.

2. *Finances.*—First, that the $5 per year fee be discontinued; that no $5 per year fees be accepted after July 1, 1946, and that none of the incoming members be put in that category.

Second, that the State Chairmen in Region V be polled to find out if their groups would approve an annual dues of $20, which would include a subscription to the JOURNAL OF PEDIATRICS and abstracts in English from the *American Journal of Diseases of Children.* The remainder of the funds would be spent, first, upon the secretarial expenses involved in the conduct of the affairs of Region V in the central office; and, second, to provide funds for the expenses of the Regional Chairman to at least one meeting of the Executive Board, and, if possible, to pay partial expenses for either one or two of the Associate Chairmen.

After extended discussion, the Executive Board voted to accept the proposed measures, and to empower the Secretary to proceed along the lines suggested.

Dr. Martmer proposed that the following amendment to Article III, Section 2, of the By-Laws, be submitted to the members: that the words "With the exception of Region V" be deleted from this section. This motion was carried.

---

*Presented personally by Dr. Félix Hurtado, of Havana, Cuba.

Reports of Committees

Report of the Committee on Cooperation With Governmental and Medical Agencies

The primary function of this Committee (formerly the Child Health Relations Committee) is to promote a working relationship of the Academy with governmental and medical agencies in the interest of better child health for every child in the United States. This would seem to require the creation of a good working Child Health Conference composed of the chief governmental agencies in this field, namely, the Children's Bureau and the United States Public Health Service, and the chief medical agencies in this field—the American Medical Association and the American Academy of Pediatrics.

The Executive Board of the Academy at St. Louis in November, 1944, empowered our Committee to develop a liaison with the American Medical Association and United States Public Health Service for the purpose of dealing with any emergency child health situations which might arise.

At the meeting of the Committee the next day, the following motion was passed: "That this Committee, as empowered by the Executive Board, shall request the American Medical Association, and the United States Public Health Service to appoint two pediatricians to be available for conference with our Committee whenever any child health situation shall be referred to our Committee by the Executive Board, which calls for definite need of a joint study of the problems and the effective working relationship and cooperation of national governmental and medical agencies."

Pursuant to this action, on Dec. 4, 1944, President Wall and the Chairman of the Committee appeared before the Council on Medical Service and Public Relations of the American Medical Association in Washington, D. C., and requested that the Board of Trustees appoint two members to represent the American Medical Association at the Academy Conference. After considerable discussion the Council approved the request and on Feb. 15, 1945, the Board of Trustees of the American Medical Association appointed Dr. William Weston, member of the House of Delegates of the American Medical Association from the Section on Pediatrics and Dr. Edgar Copeland to serve as conference members of our Committee.

Following a conference with the United States Public Health Service on the same day Surgeon General Parran appointed as conference members, Assistant Surgeon General R. C. Williams, Chief of the Division of Medical Services, and Surgeon Karl Habel, a pediatrician engaged in research at Bethesda. Dr. Parran also made available as consultants, Medical Director J. P. Leake, who has had wide experience in communicable diseases, especially poliomyelitis, and Surgeon Carroll E. Palmer, who has been concerned with studies relating to Child Hygiene over a period of years. We therefore report that the liaison conference empowered by the Executive Board is now complete.

The Committee met at the Hotel Pennsylvania, New York City, on March 28, 1945, to adapt the State Level Program as to cooperation of governmental and medical agencies, adopted by the Academy in 1941, to the national level. Those present were Drs. Van Horn, Beaven, Martin, and Nichols of the Committee, President Wall of the Academy, Regional Chairman Stringfield, Chairman Kaiser of the Academy Committee on Nongovernmental Agencies, Chairman Harold Mitchell of the Academy School Health Committee, State Chairman Harrold Murray of New Jersey, Julius Levy, Associate Fellow of the Academy, and Dr. John Aikman, Chairman of the Pediatric Section of the American Medical Association. Because of government restrictions, the United States Public Health Service was represented by Director E. N. Coffey of the First District. Invited consultants included Dr. Edward Rogers, Assistant Commissioner for Medical Administration, New York State Department of Health, Dr. J. M. Wisan, Chief of the Bureau of Dental Health, New Jersey State Department of Health, and Acting Secretary of the Committee, Miss Evelyn Walker, Director of Health and welfare.

The cooperative principles of the State Level Program, adopted by the Academy in 1941, were adapted to the needs of the situation at the national level and a suggested national program of the Committee (Program Appended) was evolved in detail.

The following motions were adopted:

No. 1.—That the suggested National Program as submitted by the Committee be approved by the Executive Board.

No. 2.—That the Executive Board authorize one additional conference member to represent officially the Children's Bureau.

Nos. 3 and 4.—That an official representative conference member be requested from (1) the Special Child Health Committee of the Association of State and Territorial Health Officers and (2) the American Dental Association.

Special Business: Dr. Wall read a letter from the United States Food and Drug Administration in relation to assistance to agents of the Food and Drug Administration to deal with foods and drugs prepared for children. It was suggested that a subcommittee might be appointed for this purpose.

The Academy has a splendid record in many States of acting as a liaison group with governmental and medical agencies for better child health.

Respectfully submitted,
STANLEY H. NICHOLS, Chairman

PAUL W. BEAVEN
W. L. CRAWFORD
ALEXANDER T. MARTIN
OSCAR REISS
A. L. VAN HORN

SUGGESTED NATIONAL PROGRAM OF THE AMERICAN ACADEMY OF PEDIATRICS COMMITTEE ON COOPERATION WITH GOVERNMENTAL AND MEDICAL AGENCIES

1. The Academy Relationship to the American Medical Association.—The Committee on Cooperation with Governmental and Medical Agencies should work closely with the Executive Committee of the Section on Pediatrics and Council on Medical Service and Public Relations of the American Medical Association on behalf of (1) better child Health and (2) the best possible quality of pediatric medical care for every American child.

The conference members appointed by the American Medical Association and an official representative of the Council on Medical Service and Public Relations of the American Medical Association should be invited to participate at all meetings held by the Committee on Cooperation with Governmental and Medical Agencies on these two subjects.

2. Use of the Fellows of the Academy by the American Medical Association.—The President of the Academy, with the approval of the Executive Board, should confer personally with officials of the American Medical Association, offering the assistance and acknowledge child health experience of the Fellows of the Academy to the American Medical Association.

3. Use of the Fellows of the Academy by Governmental Agencies.—That the President of the Academy confer with the federal governmental agencies concerned in matters pertaining to the health of children and offer the assistance of the Academy through its Committee on Cooperation with Governmental and Medical Agencies to consider jointly the development of sound policies for the continued improvement in the health of children and to provide safeguards for the quality of pediatric medical care.

4. Use of Fellows of the Academy in the Coordination of Child Health Activities by Federal Agencies and the American Medical Association and the American Academy of Pediatrics.—The Committee on Cooperation with Governmental Medical Agencies of the Academy should aid in the formulation and coordination of the child health activities and programs of federal governmental agencies with those of the American Medical Association and the American Academy of Pediatrics; the coordination with nonmedical voluntary agencies should be worked for also as far as possible.

The Academy should sponsor a Child Health Conference, meeting regularly composed of representatives of the chief federal and medical agencies working in the child health field to carry out this coordination.

5. Use of Fellows of the Academy as Advisors of Federal Agencies.—The President of the Academy should proffer the services of qualified Fellows to act as advisors on technical questions of child health to all Federal agencies having some phase of child health activities in their programs.

6. Desirable Standards of Qualifications.—The Academy should use its influence to promote the establishment and maintenance of desirable standards regarding qualification of personnel in Federal agencies, and to work for the improvement and continued development of Merit Systems in the United States.

The two recommendations of this Committee were approved, and the President was asked to write Dr. Nichols on this point.

The question of redistricting the Academy was brought up, due to the fact that Region I has almost as many members as the other three Regions in the United States and Canada combined. It was voted to submit this to a committee, and the President appointed Dr. Martmer, Chairman, and Dr. Goehle, member.

After some discussion, the next meeting of the Executive Board was left in the hands of the President and Secretary, with the hope that it would be possible at least to get together the State Chairmen at some future meeting. It was voted that, if possible, the next meeting should be in November.

A vote of thanks was given to the hotel management at the Palmer House, Chicago; and a vote of thanks was given to the President for the conduct of the meeting.

MEETING ADJOURNED.

Correspondence

June 26, 1945

Dr. Martha M. Eliot
Associate Chief
Children's Bureau
U. S. Department of Labor
Washington 25, D. C.

Dear Dr. Eliot:

On behalf of the Academy of Pediatrics, I would express to you our appreciation of the assistance you have promised the Post-War Planning Committee in its study of children's health in the postwar era.

As you know, the committee has already formed its preliminary organization for the work at hand under the direction of the Committee of Nine appointed by the Academy, with Dr. Warren R. Sisson, Chairman, while the actual fact-finding survey and investigation will be the function of a "study committee" consisting of the Executive Secretary of the Post-War Committee (to be appointed) as Chairman, together with the representative of the Children's Bureau (Dr. Bain) whom you have designated and that of the U. S. P. H. Service (Dr. Williams), assigned by the Surgeon General.

A committee consisting of the President of the Academy as Chairman, together with the Associate Chief of the Children's Bureau and Mr. George Perrot of the U. S. P. H. Service will aid and assist the study committee in an advisory and supervisory capacity.

It is the earnest hope of the Academy that through its State-wide organization and the assistance of its entire Fellowship of some 1,600 members, in conjunction with the valuable contributions of the U. S. P. H. Service and the Children's Bureau, this important study of child health needs together with the facilities for meeting them will provide a considered basis for future planning under the joint aegis of pediatricians in association with the Federal agencies vitally concerned in the health and welfare of children.

With kindest regards,

Sincerely,

(Signed) JOSEPH S. WALL, M.D.

July 3, 1945

Dr. Joseph S. Wall
President, American Academy of Pediatrics
1864 Wyoming Avenue, N.W.
Washington 9, D. C.

Dear Doctor Wall:

Thank you so much for your letter of June 26, 1945, and for giving me up-to-date information on the organization of the Academy's survey of child health needs by the Post-War Committee of Nine, of which Dr. Warren R. Sisson is Chairman. Thank you also for bringing me a verbal report of the Executive Board's discussions concerning the expansion of the maternal and child health and crippled children's programs as recommended in the report of the Children's Bureau Steering Committee on Health Services and the recent report of the National Commission on Children in Wartime.

First, I would like to tell you that I was most happy to designate Dr. Katherine Bain, the Director of the Children's Bureau Division of Research in Child Development, to be a member of the "study committee" and to take the major responsibility for whatever contribution the Children's Bureau can make to the conduct of the study. I am also glad to serve myself on the Advisory Committee with you and Mr. George Perrot from the U. S. Public Health Service. I believe the organization that you describe will be effective in carrying out

the purpose of the study and I hope that the Committee will be able to select and appoint its Executive Secretary in the near future so that the investigation can go forward promptly.

In my discussions with you of the Academy's proposed study I have told you a number of times how influential I believe it will be in planning the development of future programs in each State during the next few years. The fact that it will be done State by State by the Academy members should mean that a new body of facts pertinent to the health needs of children in each State will be made available. Though we have national figures on mortality of children and on the causes and rates of maternal deaths, and though certain other data with respect to the presence or absence of selected health services for children are available in State health agencies, sufficient information is not available county by county, or area by area, on the basis of which detailed programs of health services and medical care for mothers and children can be mapped out on a State-wide basis.

The survey of hospital facilities by the Commission on Hospital Care will provide much information that will be useful, but, as the Academy Committee has already learned, it will not give us much detail with respect to facilities for the care of children as each State will ultimately need in planning its program for children. We do not have sufficient information on distribution of general practitioners who have had some training in the care of children, nor do we have the facts with respect to the extent of care given to children by such practitioners. We do not even have a very accurate idea of the extent to which pediatricians and other specialists serve children outside the immediate area in which they practice. We do know that certified pediatricians are largely serving urban children and that by and large children living in rural areas or in towns or small cities do not have the benefit of the skills of trained pediatricians.

If, through the Academy study, data of these kinds can be made available in each State, the State and local health departments will be in a much more favorable position to plan with the physicians and other professional persons in the State how State-wide service to children can be ultimately effectuated. To have the assistance and cooperation of pediatricians who are aware of the health needs of children and the means necessary to meet them is invaluable to the Children's Bureau and to the State agencies.

I hope the Academy membership will not misinterpret steps that must be taken now by the Children's Bureau to formulate the framework for expansion of the peacetime program for children while the Academy study is in progress. Because the over-all data that are now available to the Children's Bureau and to the State agencies show undeniable inadequacies in our health and medical services for mothers and children, the Children's Bureau has the responsibility (as I pointed out in my article published last October in THE JOURNAL OF PEDIATRICS) of making recommendations as to next steps that should be taken to extend and broaden existing programs to overcome the inadequacies.

More than a year ago, in April, 1944, the National Commission on Children in Wartime appointed a special committee on plans for children and youth to formulate a program for the immediate future. This committee has worked with the Children's Bureau and its advisory committees and has conferred with many groups of professional and non-professional persons concerned with various types of service to children. The report of the Academy committee on postwar planning, adopted last November, was considered carefully by the Commission's planning committee.

In February, 1945, the Executive Committee of the Commission adopted a report entitled "Building the Future for Children and Youth—Next Steps." This report is known to you as it was circulated among all members of the Commission before it was issued in April. It is concerned in the main with general broad policies and contains recommendations for the expansion of the maternal and child health and crippled children's programs through Federal grants-in-aid to State health agencies. It takes the position that programs of health and medical service to mothers and children should be administered by the States, and that funds for over-all operation and service should be matched by the States. It proposes that the major proportion of the cost of care given to individual mothers and children should be borne by Federal funds. It outlines in broad terms the types of service that should be made available and points out that they should be developed over a ten-year period. It outlines certain conditions that should be met by States before approval is given to a State plan —conditions that would have as their objective State-wide availability of service to all mothers and children who elect to participate in the service, high standards of care and improvement in quality of care through training, adequate remuneration for professional services, and the use of various types of health center, clinic, and hospital facilities and expert consultation service.

The Commission report has been transmitted to the President and much interest has been expressed in finding the way to implement the proposals contained in it.

I would like to point out again, however, that the recommendations of the Commission are in broad national terms only. There has been no attempt to break the proposals down by States. The study now being conducted by the Academy is, therefore, urgently needed and will, I am sure, make available data that will be invaluable to the State and local agencies in planning the types of expansion each State and community needs and the order in which the different elements of the program for children should develop.

Several times recently you have brought to my attention comments by members of the Academy on the recommendation made by the Advisory Committee on Services for Crippled Children and by the Steering Committee on Health Services that such chronic illnesses as diabetes, allergy, or epilepsy should be included when an expansion of the crippled children's program could be brought about. I can understand very well why there may be objection to classifying these conditions as "crippling." Some explanation of what lies back of this recommendation may help.

No definition of the term "crippled child" has been made by the Children's Bureau because of the differences in State laws and administrative regulations. Some States have interpreted the term broadly and included eye conditions that require operation, burns and other conditions requiring plastic surgery. Iowa from the beginning of the program has included diabetes and congenital syphilis. As you will remember, pediatricians who were members of the Advisory Committee on Services for Crippled Children very early urged that pediatric service be provided for all crippled children. In 1937 at the meeting of the State Chairmen in Kansas City, Dr. Maurice L. Blatt of Illinois and Dr. Laurence R. DeBuys of Louisiana raised with me this question of the definition of crippled children and whether children with heart disease could be included under this program. In January, 1939, the Executive Board of the Academy passed a resolution originating in Region I as follows:

> "Resolved: In view of the well-established fact that the child with cardiac disease is a cripple in every sense of the word, it is the consensus of opinion of the assembled pediatricians of Region I of the Academy of Pediatrics that the cardiac crippled should be given medical, hospital, and convalescent care by the State agency responsible for the program of services to crippled children."

In May, 1939, Dr. Grulee appeared before the Senate Subcommittee of the Committee on Education and Labor at hearings on S. 1620 and presented testimony in favor of including children with cardiac disease under the crippled children program. Following this hearing the funds for services to crippled children were increased by one million dollars and the Senate committee report mentioned the need for additional service to children with heart disease.

Since then the orthopedic surgeons on the Advisory Committee have been increasingly understanding of the necessity to broaden the program and have given the pediatricians on the Advisory Committee great support. The recommendation of last December was made in this same spirit and I feel sure there was no intent in their action other than to use the legislative procedure to spread the value of the program to an increasing number of children who are suffering from conditions that chronically handicap them in their usual activities and so require special services.

One of the primary reasons for separating the program of services for crippled children from the maternal and child health program at the beginning was the special necessity of providing more than the care of a physician or surgeon or hospital care if all the needs of these children were to be met. I do not have to point out to you the need for medical social workers to plan for adjustments in the home, or for follow-up nursing service or physical and occupational therapy or for the special need to help parents understand and adjust themselves to accepting and planning for the care of a child who may have a lifelong handicap.

There may, of course, be real objections to describing a child with diabetes or epilepsy or an allergic condition as "crippled" and I am in sympathy with that point of view. It is the desire of the Children's Bureau to bring the work under the crippled children's program closer to that under the maternal and child health program in order that the services available through the latter may be available to the former. To this end the Bureau four years ago placed the administration of both programs under a single division in the Children's Bureau. As you know, Dr. A. L. Van Horn is Director of this division. Furthermore, the Bureau has consistently taken the position that crippled children's programs in the States should be brought under the State health agencies, when not already there, in order that a

unified approach to the health and medical problems of all children might be developed and that medical direction could be assured. During the past 9 years transfers of the crippled children's program to the State health agency has taken place in 9 States, the most recent being the action of the Texas State legislature in May, 1945, transferring the program from the Department of Education to the Department of Health.

I have gone into this at some length because I would like you to understand the Bureau's attitude in this matter.

I hope you will express to the Executive Board of the Academy my eagerness that the Children's Bureau should be of the greatest possible help to the Academy in the prosecution of its survey and study, and reiterate my satisfaction that it is being undertaken.

Sincerely yours,

(Signed) MARTHA M. ELIOT

Martha M. Eliot, M.D.
Associate Chief

The Social Aspects of Medicine

The physician called, when the child is born, is the pediatrician, and his problem is to keep the new baby well. And since, as the baby grows into the child, the child continues in need of guidance and protection, the pediatrician remains a practitioner of preventive medicine. The pediatricians of this country in particular owe a large debt to that really great man, Dr. L. Emmett Holt, not only for starting pediatrics as an organized department of medicine but for giving it a great shove along the road of preventive medicine, the momentum of which can still be felt. I was a pupil of Dr. Holt in 1904 and 1905 and can testify that the obligation to keep the child well was always in the forefront of his mind. This was the motive force which caused him to write his guide of questions and answers for mothers which exercised probably a greater educational influence among the laity on the upbringing of children than any other book which has ever been written. His textbook, so influential in molding the thought and attitude of physicians, differed from others in that so much of it was devoted to the ways of keeping children healthy. But whatever the reasons, pediatricians have been among the first to be concerned with raising and maintaining the standards for the production and distribution of milk. They were the ones who established and conducted the Infant Welfare Stations, where they acted not only as physicians, but also as individual teachers to the mothers, furnishing the community with a preceptorial type of instruction regarded as so valuable in our universities. They have been the teachers of the art of feeding and raising children and have recently extended their responsibilities into the field of mental health. The pediatrician of today represents the finest type of general practitioner in that in his attitude, feelings of obligation for the general welfare of his patients, and his practice of preventive medicine he represents what the ideal family physician should be. I mention all this because I believe that the pediatricians have an advanced point of view which should enable them to face the future in a particularly liberal frame of mind, and because I think that from inheritance as well as from the requirements of their daily professional lives they are the ones who should be leaders in the social reorganization of medicine which is bound to come.

All thoughtful people are conscious that great changes in the organization of society the world over are in progress. These had been developing obviously enough prior to the outbreak of this present war, but the war with its loosening and stirring-up processes has undoubtedly intensified their progress. We are in the beginning of a great social upheaval. No one can foresee just what changes will result, but it is possible to speak in generalities. A movement throughout the world toward the left, which has as its ostensible object the improvement in the conditions of the average man and his family, is in process. More consideration is going to be given and better provision made for economic welfare, housing, comfort, recreation, and, in particular, for the maintenance of health and for safeguard against helplessness during periods of joblessness, illness, and old age. The power of the individual to acquire great wealth is going to be diminished, and institutions such as our private hospitals, endowed medical schools, and universities dependent on private philanthropy will have to look for support to other sources, very probably to the State. There is undoubtedly going to be increased power vested in the State; in other words, in spite of every desire to maintain individualism and power of initiative, more centralized control is going to be forced upon us, for the reason that such is the simple, direct way for the people to get these things which they so fervently desire. Medical care is so insinuated into the structure of society that inevitably it will be caught in the general upheaval and will share in the changes in general. No one can foresee just what the changes in medical care will be, but it is safe to say that, whether we like it or not, they will be considerable, that they will be initiated and dictated largely by the lay public, that the preventive aspects of medicine will have a much more important place than at the present time, and that medical care will be extensively reorganized and increasingly regulated and controlled by centralized authority.

All that we have to do in order to appreciate the truth of what has just been said is to look at the world around us. Take England, for example. In England the National Health Insurance Act, carrying with it the so-called Panel System of medical care, was

forced through Parliament in 1911 by the Lloyd George Government against the most determined opposition of the British Medical Association. Looking back at what happened, one can see that the legislation was a revolt of the public from the leadership of the medical profession. The Panel System was full of defects which were subsequently partially rectified through the aid of a committee of physicians appointed by the Ministry of Health. It is generally conceded that, had the physicians of England tried to guide instead of uncompromisingly oppose, they could have made the Panel System much better for the public and for themselves from the outset. In 1943 the Beveridge Plan, which contains an elaborate system for health insurance and medical care with the creation of a system of fully equipped and staffed hospitals and health centers under State control, was made public and created enormous interest among the lay public. Indeed, the plan seemed so popular that its provisions were embodied by the Churchill Government with relatively small change in the British White Paper.

In Scandinavia an elaborate system of state medicine has been in operation for years and more recently one has been introduced and put to test in New Zealand.

In this country, we have witnessed the development of the Wagner-Murray-Dingle Bill and this bill in revised form is now before a committee of Congress. The Wagner-Murray-Dingle Bill contains ideas and provisions similar in many respects to those in the British White Paper, including health insurance, preventive medical care, improvements in the facilities for the kind of medical care rendered, and a distribution of physicians, hospitals, and medical centers determined by community requirements instead of the location of money. Other indications of the trend in medical care in this country are to be found in the special system for medical care as set up by the Group Health Association for federal civilian employees in Washington, D. C., over which the American Medical Association fought and sustained so conspicuous a legal defeat, and also in the organization of medical care at the Kaiser Shipbuilding Plant. Many other examples in which large groups of lay people have organized their own systems could be cited. The truth is that scientific advances in medicine have far outstripped their social applications. People are beginning to realize that there exists a better kind of medicine than is generally available. In particular among the great labor groups, one sees this awareness and the full intention of obtaining these advantages.

In summary, several facts stand out clearly. A movement in the field of medical care has begun and it is plainly toward State Medicine. Moreover, on every side it is coming from the people themselves. It is just a part of a much greater movement, also emanating from the people and actuated by the vision of more security and comfort and better protection from disease and its economic consequences. It is world wide in its dimensions, and has the uncontrollable force of all world movements.

We physicians have power to guide the forces of change; it is the personal opinion of the writer that we have very little power to stop them. Therefore, at this critical time, the social questions pertaining to medicine are every bit as important, if they are not more important, than the scientific ones. Yet no medical journal has thrown open its columns with the invitation to a free discussion of them. For the more radically minded, it has been necessary to go to the socioeconomic group of journals or to those devoted to public health, but these are publications which fail to reach the medical profession generally. Accordingly, at the last meeting of the Academy of Pediatrics, the suggestion was made that the JOURNAL OF PEDIATRICS establish a column which would have as its object the free discussion of the social aspects of medicine, one which would serve both as a clearing house for ideas and a source of factual information. The editors of the JOURNAL have now embarked on this policy and have made the writer responsible for the conduct of the column.

We now come to the important question: what will be the policy of the editor of the column? In brief, it will be to present information in regard to developments of a social nature in medicine with particular stress on pediatrics and to promote expressions of ideas and discussions which will result in constructive thoughts and the development of the best policies. If any of us wished to build a hospital, one of the first things we would do would be to visit other hospitals in order to learn their good points and defects. In making up our minds in regard to the best program for medical care in the future, a helpful step would be to learn the plans and experiences of other people. Accordingly, the editor will try to secure expositions of the systems of medical care which have been in operation for some time in Scandinavia and in New Zealand, a summary of the proposals for medical care in the British White Paper, and also a critical exposition of the revised Wagner-Murray-Dingle Bill which is very difficult for the nonlegal mind to understand on account of its phraseology and intricacy. When possible, pediatricians will be secured as authors. The editor will also invite communications from pediatricians and will not exclude those of others, some of

whom may not even be physicians, provided they furnish interesting and helpful ideas or information. The editor will not be disappointed if the column at times becomes decidedly "hot." Of course, it will be impossible to publish *all* communications which may be sent to the JOURNAL. This does not mean that the editor will exclude matter because it differs from opinions which he may hold or develop as he goes along but rather that he will use his best judgment in selecting contributions that present different points of view. He will welcome extremes because there is nothing which brings out vigorous reactions as they do. No unsigned contribution will be accepted. It is expected that the column will have a certain amount of autonomy which will follow from the fact, understood by everyone at the outset, that the views expressed by contributors will not be taken as expressing the opinions of the Editorial Board or the beliefs or policies of the Academy. Through all this the editor will attempt to remain as impartial and fair-minded as he is capable of being.

Before concluding, a word of caution is in order. When Galileo declared the earth round, the Catholic Church, in the person of the Pope, silenced and punished him. When Darwin brought forward the theory of evolution, obstinate opposition arose not only from the laity but also from scientists. The ideas were too big and different to be swallowed and digested immediately. The human mind instinctively dislikes change because it fears change, particularly when the change involves the unknown, leaving security for doubt. Yet all of us know in the depths of our minds that progress means change and that change in the right direction is the only way in which progress can be attained. We must all of us, therefore, in this critical time, take precautions against being prejudiced against ideas just because they are new and strange. We must attempt to obtain a detached point of view and if new ideas seem on adequate study good, we must not be afraid to try them.

E. A. PARK

News and Notes

The deaths of the following Fellows have been reported to the JOURNAL:

Dr. Thomas M. Watson, Greenville, N. C., on March 12.
Dr. E. J. Barnett, Spokane, Wash., on March 29.
Dr. Frederick B. Miner, Flint, Mich., on April 26.

Dr. Charles Fremont McKhann, vice-president in charge of research at Parke, Davis & Company of Detroit, Mich., and formerly professor of pediatrics at the University of Michigan, has been named Professor of Pediatrics at the Western Reserve University School of Medicine and Director of Pediatrics at University Hospitals, Cleveland, Ohio.

He succeeds Dr. Henry J. Gerstenberger who becomes Professor Emeritus of Pediatrics beginning with the next school year. Dr. John A. Toomey will continue as Professor of Clinical Pediatrics and Contagious Diseases at Western Reserve University, at City Hospital, and also at the University Hospitals. He has been Acting Director of Pediatrics at the University Hospitals since July, 1944, when Dr. Gerstenberger was granted a leave of absence to devote his time to scientific writing and preparing a history of the Babies and Children's Hospital.

Dr. Estella Ford Warner has been transferred from the Chicago to the Kansas City, Mo., office, to become District Director of United States Public Health Service District No. 7.

The Pediatrician and the War

The following promotions have been reported:

Army

Major Paul D. Clark, Burlington, Vt., to Lieutenant Colonel
Captain Charles W. Cory, Saginaw, Mich., to Major
Major Merrill W. Everhart, New Orleans, La., to Lieutenant Colonel
Captain Richard J. Lien, Rochester, Minn., to Major
Major Edward T. O'Donnell, Wilmington, Del., to Lieutenant Colonel
Lieutenant Samuel J. Werlin, Troy, N. Y., to Captain
Captain A. Alvin Wolf, Chicago, Ill., to Major

Dr. Walter B. Seelye, Seattle, Wash., has been retired from Active Service in the Army and has returned to practice.

Dr. H. Vaughn Scott, Fort Wayne, Ind., was released from Active Service in the Navy in May.

Comment

THE SOCIAL ASPECTS OF MEDICINE

Beginning with this number the JOURNAL is starting a new department under the above caption. A statement of its purposes and scope by the Editor in charge appears on page 202.

At the meeting of the Academy in St. Louis in November, 1944, the suggestion was made from the floor at the business session that the JOURNAL present from time to time factual information in regard to the changes that are taking place in medical organization and practice and open its pages to a discussion of these changes.

The idea was discussed by the Editorial Board and a unanimous opinion reached that there was great need for an unbiased unemotional discussion of the social aspects of medicine, and that the JOURNAL should attempt to develop such presentation. It was finally decided that the best method of presentation was to develop a special department. Dr. Edwards A. Park was selected as the Editor to be in charge of the department.

Certain facts in regard to the material which will be presented in future issues and to the purpose of the column must be kept clearly in mind. First, the views expressed must not be considered or looked upon as in any way expressing the opinion of either the Academy of Pediatrics, or its Executive Board, or the Editors or Editorial Board of the JOURNAL. Such opinions and statements will appear as in the past as part of the Academy proceedings and minutes, or as editorials. Second, it is not a department of propaganda for or against anything except intellectual dishonesty.

It is the feeling of the Editors that, while physicians are trained and accustomed to look upon technical changes and advances in medicine with a detached scientific attitude seeking only the truth, when questions involving social and economic changes in medical organization and practice come under discussion an emotional attitude is apt to dominate the thinking and approach.

Cannot we pediatricians with our splendid heritage and ideals of service, show that these important questions can be discussed fairly, intelligently, and unemotionally and that honest differences of opinion lead ultimately to the truth and not simply to personal biased antagonistic attitudes on the part of individuals?

The development of the new department is an answer on the part of the Editorial Board that it feels this can be done.